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# SYSTEMATIC REVISION OF THE CHLAMYDINAE (PECTINIDAE, BIVALVIA, MOLLUSCA) OF THE EUROPEAN CRETACEOUS

## PART 1 : CAMPTONECTES

BY

Annie V. DHONDT

(With 2 plates)

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ABSTRACT

This paper is the first part of a series dealing with the systematic revision of the European Cretaceous *Chlamydinae (Pectinidae, Bivalvia, Mollusca)*. Here, seven species of the genus *Camptonectes* AGASSIZ, L. *in* MEEK, F. B., 1864 and of the subgenus *Boreionectes* ZAKHAROV, V. A., 1965 are described : *C. (C.) cottaldinus* (D'ORBIGNY, A., 1847), *C. (C.) striatopunctatus* (ROEMER, F. A., 1839), *C. (C.) virgatus* (NILSSON, S., 1827), *C. (C.) gaultinus* (WOODS, H., 1902), *C. (B.) cinctus* (SOWERBY, J., 1822), *C. (B.) dubrisiensis* (WOODS, H., 1902), *C. ? milleri* (SOWERBY, J. de C., 1836).

RESUME

Ce travail est le premier d'une série traitant de la révision systématique des *Chlamydinae (Pectinidae, Bivalvia, Mollusca)* du Crétacé européen. Sept espèces du genre *Camptonectes* AGASSIZ, L. *in* MEEK, F. B., 1864 et du sous-genre *Boreionectes* ZAKHAROV, V. A. 1965 sont décrites : *C. (C.) cottaldinus* (D'ORBIGNY, A., 1847), *C. (C.) striatopunctatus* (ROEMER, F. A., 1839), *C. (C.) virgatus* (NILSSON, S., 1827), *C. (C.) gaultinus* (WOODS, H., 1902), *C. (B.) cinctus* (SOWERBY, J., 1822, *C. (B.) dubrisiensis* (WOODS, H., 1902), *C. ? milleri* (SOWERBY, J. de C., 1836).

ZUSAMMENFASSUNG

Diese Arbeit is der erste Teil in einer Reihe von systematischen Revisionen der europäischen Kreide *Chlamydinae (Pectinidae, Bivalvia, Mollusca)*. Sieben Arten der Gattung *Camptonectes* AGASSIZ, L. *in* MEEK, F. B., 1864 und der Untergattung *Boreionectes* ZAHKAROV, V. A., 1965 sind beschrieben : *C. (C) cottaldinus* (D'ORBIGNY, A., 1847), *C. (C.) striatopunctatus* (ROEMER, F. A., 1839), *C. (C.) virgatus* (NILSSON, S., 1827), *C. (C.) gaultinus* (WOODS, H., 1902), *C. (B.) cinctus* (SOWERBY, J., 1822), *C. (B.) dubrisiensis* (WOODS, H., 1902), *C. ? milleri* (SOWERBY, J. de C., 1836).

## INTRODUCTION

The present paper is the continuation of a systematic revision of the European Cretaceous *Pectinidae* and *Amusiidae (Bivalvia, Mollusca)*. Two papers have been written previously : one on « smooth pectinids » (i.e. *Entolium* and *Propeamussium (Amusiidae)* and *Syncyclonema (Pectinidae)* (1971) and one on *Neitheinae (Pectinidae)* (1973).

This paper is the first of a series on the subfamily *Chlamydinae (Pectinidae)*.

The present part is on the genus *Camptonectes*; the other parts will discuss *Lyropecten (Aequipecten), Chlamys, Mimachlamys* and *Merklinia*.

Seven species of the genus *Camptonectes* AGASSIZ, L. *in* MEEK, F. B., 1864 and the subgenus *Boreionectes* ZAKHAROV, V. A., 1965 are described; four — *C. (C.) cottaldinus* (D'ORBIGNY, A., 1847), *C. (C.) striatopunctatus* (ROEMER, F. A., 1839), *C. (C.) virgatus* (NILSSON, S., 1827), *C. (B.) cinctus* (SOWERBY, J., 1822) — that have a wide geographical and stratigraphical distribution are redescribed. All available specimens from the various collections which have been studied are taken into account. The variability within these four species has thus been established.

For all the species described a critical synomy list is included, the location of the type-specimens of the nominal taxa is given as well as the type-strata and type-localities. The geographical and stratigraphical distribution is based on specimens which I have studied; this makes it necessarily incomplete, particularly as far as East European countries are concerned.

Palaeoecologically it is noteworthy that *Camptonectes* is not known from deposits with Tethyan Rudist bioherms.

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## SYSTEMATIC DESCRIPTIONS

### Abbreviations

#### Morphological terms

A. A. : apical angle.
L : left.
R : right.
spec. : specimen(s).
U. P. D. : umbo-pallial diameter, also called height (H.).
W. : width.

#### Systematic terms

O. D. : by original designation.
S. D. : by subsequent designation.

#### Geographical terms

See the beginning of the geographical index.

#### Collections

B. : Paläontologisches Museum der von Humboldt Universität, Berlin.
B. M. : British Museum, Natural History, London.
DR. : Staatliches Museum für Geologie und Mineralogie, Dresden.
Ec. Min. : Ecole des Mines (collection now in Faculté d'Orsay, near Paris).
Geol. Bund. : Geologische Bundesanstalt, Vienna.
Geol. Sci. : Geological Sciences Institute, London.
GH. : Geologisches Staatsinstitut, Hamburg.
GR. : Sektion Geologische Wissenschaften der Ernst-Moritz-Arndt-Universität, Greifswald.
Halle : Geiseltal Museum der Martin-Luther-Universität-Halle-Wittenberg, Halle a.d. Saale.
I. R. Sc. N. B. : Institut Royal des Sciences naturelles de Belgique — Koninklijk Belgisch Instituut voor Natuurwetenschappen, Brussels.
KO. : Mineralogisk Museum, Copenhagen.
Lund : Palaeontologiska Institutionen, Universitet, Lund.
Ma. : Natuurhistorisch Museum, Maastricht.
Mü. : Institut für Paläontologie und historische Geologie, Bayerische Staatssammlung, Munich.
Musé. : Muséum national d'Histoire naturelle, Paris.
Mus. Gen. : Muséum d'Histoire naturelle, Geneva.
Mus. Laus. : Musée géologique, Lausanne.
N. M. W. : Naturhistorisches Museum, Vienna.

R. U. G. : Laboratorium voor Paleontologie, Rijksuniversiteit, Ghent.
S. M. : Sedgwick Museum, Cambridge.
U. C. L. : Université Catholique de Louvain.
Univ. Neuch. : Laboratoire de Géologie, Université de Neuchâtel.
Univ. Sofia : Katedra de Paleontologia, Kliment Ochridski University, Sofia.

Signs in synonym-lists

1870 — There is no reason to doubt that this reference belongs to the species discussed, but there is not sufficient proof to be certain.
? 1870 — The specific attribution of this author seems questionable.
. 1870 — The specific attribution of this author is undoubtedly correct.
v . 1870 — I have studied the original to the description by this author and I am convinced that it belongs in the species here discussed.
v. ? 1870 — I have studied the original to the description by this author and I doubt the specific attribution.
(1870) — The species is mentioned in a list; the correctness of the specific attribution cannot be checked.
p. p. — Pro parte : not all the specimens mentioned by the author belong to the species here discussed.

Family PECTINIDAE RAFINESQUE

Subfamily *CHLAMYDINAE* VON TEPPNER, W., 1922
em. SOBETSKI, V. A., 1961

## Genus Camptonectes AGASSIZ, L. in MEEK, F. B., 1864

Type-species : *Pecten lens* SOWERBY, J., 1818 O. D.

Diagnostic characters of *Camptonectes :*

1. The sculpture consists of minute punctae lying close to one another on striae diverging fan-wise from the umbo to the pallial margin and to the side-margins.
2. The valves are more convex than in other *Chlamydinae* and almost equilateral; the left valve is always more convex than the right valve.
3. The auricles are unequal; on the right valve the anterior auricle is elongated and winglike and has a deep byssal sinus.
4. There is no macrosculpture which does not follow microsculpture; hence it is radially diverging and/or concentric.
5. The shell is relatively thick and never brittle.

## Subgenus Camptonectes

### Diagnosis

The valves are orbicular or slightly elongated; the auricles are rather broad and large. The concentric ornamentation is less marked than the radial ornamentation. Most species are small to medium-sized.

### Geographical distribution

Cosmopolitan, but not in Tethyan Rudists bioherms.

### Stratigraphical range

Lower Jurassic to Upper Cretaceous.

## Camptonectes (Camptonectes) cottaldinus (A. d'Orbigny, 1847)

(Pl. II, fig. 2)

| | | | |
|---|---|---|---|
| | 1843 | — *Pecten orbicularis* | A. Leymerie, p. 27. |
| (non | 1814 | *Pecten orbicularis* Sowerby) | |
| v . | 1845 | — *Pecten circularis* | E. Forbes, p. 249. |
| (non | 1835 | *Pecten circularis* G. B. Sowerby. | |
| non | 1836 | *Pecten circularis* A. Goldfuss). | |
| v . | 1847 | — *Pecten Cottaldinus* d'Orbigny | A. d'Orbigny, pp. 590-591, pl. 431, f. 7-11. |
| v . | 1850 | — *Pecten Cottaldinus* d'Orb. | A. d'Orbigny, p. 83, n° 387. |
| | (1852) | — *Pecten Cottaldinus* d'Orb. | A. Buvignier, p. 473. |
| | (1854) | — *Pecten Cottaldinus* d'Orb. | G. Cotteau, p. 115. |
| v ? | 1861 | — *Pecten Cottaldinus* d'Orbigny | P. de Loriol, pp. 103-104, pl. 13, f. 3. |
| . | 1868 | — *Pecten Cottaldinus* d'Orb. | E. d'Eichwald, p. 431. |
| . | 1868 | — *Pecten Cottaldinus* d'Orbigny | F. J. Pictet, pp. 261-262, pl. 40, f. 6 & 7, sous la désignation de Peigne lisse. |
| v . | 1870 | — *Pecten Cottaldinus* d'Orbigny | F. J. Pictet & G. Campiche, pp. 197-198, pl. 167, f. 3a-d sub « Pecten coquandianus » (laps. cal. on the plate). |
| | (1871) | — *Pecten (Syncyclonema) Cottaldinus* d'Orb. | F. Stoliczka, p. 428. |
| ? | 1884 | — *Pecten Roemeri* n. sp. | O. Weerth, p. 54. |
| ? | 1895 | — *Pecten Cottaldinus* d'Orb. | G. Maas, p. 269. |
| | (1898) | — *Pecten Cotaldinus* (sic) d'Orb. | J. Simionescu, p. 36. |

| | | |
|---|---|---|
| 1900 | — *Pecten* cf. *Cottaldinus* d'Orb. | G. MUELLER, p. 551, pl. 24, f. 4. |
| v . 1902 | — *Pecten (Camptonectes) Cottaldinus* d'Orbigny | H. WOODS, pp. 156-157, pl. 29, f. 1, 2 a-b, 3 a-b. |
| (1903) | — *Pecten* aff. *Cottaldinus* d'Orb. | L. PERVINQUIÈRE, p. 54. |
| 1905 | — *Pecten (Camptonectes)* cf. *Cottaldinus* d'Orb. | E. HARBORT, p. 38. |
| 1908 | — *Pecten (Camptonectes) Cottaldinus* d'Orb. | F. L. KITCHIN, p. 65, pl. 2, f. 4. |
| . 1912 | — *Pecten (Camptonectes) Cottaldinus* d'Orbigny | L. PERVINQUIÈRE, p. 442. |
| (1912) | — *Pecten (Camptonectes) Cottaldinus* d'Orb. | W. KILIAN & P. REBOUL, p. 420. |
| 1914 | — *Pecten (Camptonectes) Cottaldinus* d'Orb. | M. MORAND, p. 234. |
| (1918) | — *Pecten (Camptonectes ) Cottaldinus* d'Orb. | W. KILIAN, p. 339. |
| (1919) | — *Pecten (Camptonectes) Cottaldinus* d'Orb. | I. TOMITCH, p. 118. |
| ? 1921 | — *Chlamys (Camptonectes) Cottaldinus* d'Orb. | S. GILLET, p. 21. |
| 1922 | — *Chlamys (Camptonectes) Cottaldinus* d'Orb. | S. GILLET, pp. 91-92. |
| (1922) | — *Pecten (Camptonectes ) cottaldinus* d'Orb. | G. W. BUTLER, p. 315. |
| 1927 | — *Pecten (Camptonectes) Cottaldinus* d'Orb. | E. ROCH, p. 34. |
| (1933) | — *Pecten Cottaldi* d'Orb. | A. HEIM, E. BAUMBERGER, S. FUSSENEGGER, p. 205. |
| 1957 | — *Pecten Cottaldi* d'Orb. | M. S. ERISTAVI, p. 42. |
| ? (1957) | — *Pecten cottaldinus* | W. HALLER, p. 133, pl. 20, f. 2. |
| (1958) | — *Pecten* cf. *cottaldinus* d'Orb. | J. FÜLÖP, p. 76. |
| (1960) | — *Camptonectes cottaldi* d'Orb. | M. S. ERISTAVI, p. 51. |

## Location of type-specimens

Muséum national d'Histoire naturelle, Paris : D'ORBIGNY coll. n° 5124.
*Pecten roemeri :* WEERTH collection, Lippe'schen Landesmuseum, Detmold (G. F. R.).

## Stratum typicum :

Néocomien (Néocomien inférieur) (Valanginian-Hauterivian).
*Pecten roemeri* : Neocomsandstein (Neocomian).

Locus typicus :

Auxerre (Yonne, France).
*Pecten roemeri* : Tönsberg (Teutoburger Wald, G. F. R.) (O. D.).

## Original description

« P. testâ ovatâ, transversâ, depressâ, subaequivalvi; valvâ superiore subconvexâ, concentricé inaequaliter tenuiterque sulcatâ; sulcis ad marginem approximatis, obliquè tenuissimè striatis; striis interruptis simplicibus, valvâ inferiore convexiusculâ; auriculis magnis, inaequalibus, transversim plicatis, obliquè striatis.

*Dimensions*. Largeur, 80 millim. — Par rapport à la largeur : longueur, 94/100; épaisseur, 33/100; longueur de la facette des oreilles, 42/100. — Angle apical, sans les oreillettes, 98°.

*Coquille* ovale, transverse, très-déprimée, subéquivalve, la valve supérieure néanmoins beaucoup plus bombée que l'autre. Les deux valves, d'un aspect presque lisse à la vue simple, sont ornées de lignes impressionnées concentriques, simples, nulles près des crochets, mais d'autant plus rapprochées qu'elles avoisinent le bord et qu'elles appartiennent à un plus vieil individu. Avec ces stries concentriques viennent se croiser obliquement des stries divergentes déliées, simples, interrompues à chaque strie concentrique. Les oreilles sont très inégales : l'oreille buccale supérieure est grande, triangulaire, plissée en travers et striée obliquement; l'oreille buccale inférieure est très échancrée.

*Rapports et différences*. N'ayant vu que très-imparfaitement les caractères de cette espèce, on l'a rapportée au *P. orbicularis* de SOWERBY; mais indépendamment des stries obliques qui caractérisent celle-ci, ainsi que le manque de lames concentriques, elle se distingue encore par ses oreilles inégales, tandis que le *P. orbicularis* les a égales et appartient à un tout autre groupe.

*Localité*. Elle est propre à l'étage néocomien où elle a été recueillie à Auxerre, à Saint-Sauveur (Yonne), par MM. COTTEAU, ROBINEAU-DESVOIDY, BAUDOUIN et d'ARCHIAC; à Vandeuvre (Aube), par moi; à Renaud-du-Pont, à Maisons-sous-les-Ecorces (Doubs), par M. CARTERON; à Bettancourt-la-Ferrée et à Wassy (Haute-Marne), par MM. TOMBECK et CORNUEL. »

## Additional description

Number of specimens studied : 211.

| | |
|---|---|
| British Barremian | 4 |
| Bulgarian Hauterivian | 1 |
| French Neocomian s. l. | 53 |
| French Valanginian | 9 |
| French Hauterivian | 6 |
| French Barremian | 6 |
| Austrian Neocomian | 2 |
| German Neocomian s. l. | 5 |
| Swiss Neocomian | 39 |
| Swiss Valanginian | 25 |
| Swiss Hauterivian | 13 |

| | |
|---|---|
| Swiss Barremian ... ... ... ... ... ... ... ... | 10 |
| British Aptian ... ... ... ... ... ... ... ... | 35 |
| Swiss Aptian ... ... ... ... ... ... ... ... ... | 3 |

Measurements :

Holotype : U. P. D. 68.2 mm; W. 60.0 mm; A. A. 91° (D'ORBIGNY's own indications are, as usually, 25 % exaggerated).

Specimens from the *Perna* Bed in Atherfield (Isle of Wight) :

U. P. D. varies from 36.6 mm to 68.5 mm; av. 58.2 mm (n = 15).
W. varies from 34.4 mm to 66.4 mm; av. 52.9 mm (n = 15).
A. A. varies from 88° to 106°; av. 97.8° (n = 15).

An incomplete valve from Sandown Bay (Isle of Wight, Aptian) has a U. P. D. of 73.7 mm.

Description :

Diagnosis. — Medium to large, elongated *Camptonectes* species with fairly large auricles, particularly at the posterior shell-side; concentric ornamentation is present on both valves, but is not always clearly developed.

The valves are always ovate and, for the genus, relatively flattened; the left valve is more inflated than the right valve.

Right valve : covered with numerous well-developed, concentric growthlines, which have varying interspaces and are sometimes covered with elevated laminae. The anterior apical margin is concave and longer than the straight posterior apical margin. Because of these different apical margins the shells have an asymetrical shape. The anterior auricle is wing-like and elongated; sometimes it seems to be folded along the apical margin because of a ridge closing the ctenolium of the young shell; the byssal sinus is deep and broad. The posterior auricle is almost rectangular; on both auricles the concentric growthlines described for the disc continue and they are far more clearly developed here than on the central part of the disc.

Left valve : shell-shape seems less oblique than on the right valve because both apical margins are straight, although the posterior apical margin is longer than the anterior one. The ornamentation is similar to that on the right valve, but the growthlines are less pronounced and seem to lie further apart. The anterior auricle is large, almost rectangular but with a recurved outer margin and a very shallow byssal sinus. The other auricle is much smaller, but also almost rectangular. Both auricles are covered with clearly developed growthlines. On both valves the *Camptonectes*-sculpture of diverging striae covered with minute punctae is present but it is not easily visible.

## Discussion

### Variability :

The variability in *C. cottaldinus* lies — when the differences due to preservation are forgotten — in the distribution of the concentric growth-lines; on some specimens they are very numerous, but on others they are almost absent. In the latter case it is extremely difficult to differentiate *C. cottaldinus* from *C. striatopunctatus* (ROEMER, F. A., 1839), particularly when the auricles are not complete.

### Synonymy :

A. D' ORBIGNY's original material was poorly preserved; the additions he made in his figures to complete the valves were unfortunate : the auricle drawn on fig. 8 (pl. 431) is too large and too broad.

Nevertheless there has never been much confusion about this species in literature.

*Pecten roemeri* WEERTH, O. is very probably a *C. cottaldinus.*

*Pecten (Camptonectes) euplocus* LANGE, E. 1914 (pp. 209-210, pl. 16, fig. 1) from the *Trigonia schwarzi*-Schichten, Mikadi, Tanzania, is a large *Camptonectes* species related to *C. cottaldinus* (D'ORBIGNY, A., 1847). Without the original specimen it is difficult to decide whether it is specifically different or not.

### Differentiation :

*C. cottaldinus* differs from the other Cretaceous *Camptonectes* species by its relative obliquity and larger auricles.

*C. cinctus* (SOWERBY, J., 1822) differs from *C. cottaldinus* in having smaller auricles, a wider A. A., more convex valves and an orbicular shape.

*C. striatopunctatus* (ROEMER, F. A., 1839) differs from *C. cottaldinus* in having more elongated anterior auricles on the right valves and in lacking concentric ornamentation. Furthermore, the *Camptonectes*-microsculpture is clearly developed on *C. striatopunctatus.* The other *Camptonectes* species can be differentiated on the same grounds as *C. cinctus.*

### Generic attribution :

*Pecten cottaldinus* D'ORBIGNY, A., 1847 has the general shape and the ornamentation typical of *Pecten lens* SOWERBY, J., 1818 type-species of *Camptonectes;* its correct name thus becomes *Camptonectes (Camptonectes) cottaldinus* (D'ORBIGNY, A., 1847).

## Stratigraphical and geographical distribution

Valanginian : FRANCE :

Censeau (Jura) (Mus. Gen.)
Métabief (Doubs) (Mus. Gen.)
Villers-le-Lac (Doubs) (Mus. Gen., Univ. Neuch.)

SWITZERLAND :

Arzier (Vaud) (Mus. Gen., Mus. Laus.)
Boucherans (Vaud) (Mus. Gen.)
Comte (Vaud) (Mus. Gen.)
La Rusille (Vaud) (Mus. Gen.)
Sainte Croix (Vaud) (Mus. Gen.)
Vingel, Biel (Bern) (Mus. Gen.)

Hauterivian : BULGARIA :

Kotchmar, Suchetrensko (Univ. Sofia)

FRANCE :

Craz (Ain) (Mus. Laus.)
Mont Salève (Haute-Savoie) (Mus. Gen. orig. DE LORIOL P., 1861, pl. 3, f. 3.)
Morteau (Doubs) (Univ. Neuch.)
Villers-le-Lac (Doubs) (Univ. Neuch.)

SWITZERLAND :

Auberson, Sainte Croix (Vaud) (Mus. Laus.)
Créterset, Côte aux Fées (Vaud) (Mus. Laus.)
Hauterive, Neuchâtel (Neuchâtel) Univ. Neuch.)
Locle (Neuchâtel) (Univ. Neuch.)
Sainte Croix (Vaud) (DR.)
Tylonne s. Brethonnière (Vaud) (Mus. Laus.)

Barremian : FRANCE :

Auxerre (Yonne) (Mus. Gen.)
Morteau (Doubs) (Mus. Gen., Univ. Neuch.)

GREAT BRITAIN :

Atherfield (Isle of Wight) (B. M.)
Sandown Bay (Isle of Wight) (B. M.)

SWITZERLAND :

Mormont (Vaud) (Mus. Laus.)
La Rusille (Vaud) (Mus. Laus.)

Neocomian (no further stratigraphical specification) :

AUSTRIA :

Haslach, Vorarlberg (Mü.)

FRANCE :

Auxerre (Yonne) (Ec. Min., I. R. Sc. N. B., KO., Mus. Gen., Musé. also orig. D'ORBIGNY, A., n° 5124)
Bernouil (Yonne) (Mus. Gen.)
Bettancourt (Haute-Marne) (Mus. Gen.)
Censeau (Jura) (Mus. Gen.)
Cinquétral (Jura) (Mus. Gen.)
Fontenoy (Yonne) (Musé.)
Gy l'Evêque (Yonne) (B., Mus. Laus.)
La Chapelle-Vieille-Forêt (Yonne) (Mus. Gen.)
Marolles (Aube) (Mus. Gen.)
Morteau (Doubs) (Mus. Gen., Mus. Laus.)
Renaud-du-Mont (Musé.)
Sainte-Claude (Doubs ?) (Mus. Gen.)
Saint-Dizier (Haute-Marne) (Musé.)
Thieffrain (Aube) (Mus. Gen.)
Vandeuvre (Aube) (Musé.)

G. D. R. :

Quedlinburg (B.)

SWITZERLAND :

Hauterive (Neuchâtel) (Mus. Gen. Univ. Neuch.)
Landeron (Neuchâtel) (Mus. Gen.)
La Rusille (Vaud) (Mus. Gen.)
Sainte Croix (Vaud) (Mus. Gen., Univ. Neuch.)

Aptian : GREAT BRITAIN :

Lower Aptian : *Perna* Bed :
Atherfield (Isle of Wight) (B. M., S. M. also orig. H. WOODS, 1902, pl. 29 f. 2-3, B 12658-12659)

no horizon specified :

Atherfield (Isle of Wight) (B. M.)
Chale Bay (Isle of Wight) (B. M.)
East Shalford (Surrey) (S. M.)
Sandown (Isle of Wight) (B. M.)
Sevenoaks (Kent) (B. M.)
Upware (Cambs.) (B. M.)
Whale Chine (Isle of Wight) (S. M., orig. H. WOODS, pl. 29, fig. 1, Geol. Sci. orig. FORBES, E. : *Pecten circularis*)

SWITZERLAND :

Pierre carrée de Solalex (Mus. Laus.).

## Camptonectes (Camptonectes) striatopunctatus (F. A. ROEMER, 1839)

Pl. I, fig. 2

| | | |
|---|---|---|
| v . 1839 | — *Pecten striato-punctatus* Nob. | F. A. ROEMER, pp. 27-28. |
| v . 1841 | — *Pecten striato-punctatus* | F. A. ROEMER, pp. 50-51. |
| 1842 | — *Pecten striato-punctatus* Röm. | H. B. GEINITZ, p. 83. |
| 1847 | — *Pecten striato-punctatus* Roemer | A. D'ORBIGNY, pp. 592-593, pl. 432, f. 4-7. |
| . 1850 | — *Pecten striato-punctatus* Roemer | A. D'ORBIGNY, p. 119, n° 132. |
| (1850) | — *Pecten striato-punctatus* Römer | H. B. GEINITZ, p. 180. |
| (1854) | — *Pecten striato-punctatus* (p.p.) Roemer | J. MORRIS, p. 177. |
| (1854) | — *Pecten striato-punctatus* Roem. | G. COTTEAU, p. 115. |
| v . 1868 | — *Pecten arzierensis* de Loriol | P. DE LORIOL, p. 47, pl. 4, f. 3-5. |
| v . 1870 | — *Pecten arzierensis* de Loriol | F. J. PICTET & G. CAMPICHE, pp. 195-196, pl. 171, f. 3a-d. |
| (1871) | — *Pecten (Camptonectes) striato-punctatus* Roemer | F. STOLICZKA, p. 428. |
| (1871) | — *Pecten (Camptonectes) arzierensis* Loriol | F. STOLICZKA, p. 428. |
| 1877 | — *Pecten striato-punctatus* A. Roem. | G. BOEHM, p. 233. |
| 1884 | — *Pecten striato-punctatus* Roem. | O. WEERTH, p. 53. |
| . 1888 | — *Pecten arzierensis* Lor. | S. NIKITIN, pp. 73-74, pl. 2, f. 12. |
| 1889 | — *Pecten lens* Sow. var. *Morini* de Loriol | G. W. LAMPLUCH, p. 615. |
| . 1895 | — *Pecten (Camptonectes) striato-punctatus* A. Roem. | F. VOGEL, p. 54. |
| . 1896 | — *Pecten striato-punctatus* A. Römer | A. WOLLEMANN, p. 840. |
| 1898 | — *Pecten arzierensis* de Loriol | E. BAUMBERGER & H. MOULIN, p. 176. |
| ? 1900 | — *Pecten striato-punctatus* F. A. Roem. | G. MUELLER, pp. 530-531, pl. 24, f. 7. |
| . 1900 | — *Pecten striato-punctatus* A. Roemer | A. WOLLEMANN, pp. 49-50. |
| v . 1902 | — *Pecten (Camptonectes) striato-punctatus* Römer | H. WOODS, pp. 157-159, pl. 29, f. 4a-b. |
| (1903) | — *Pecten striatocostatus* Roemer (laps. cal.) | L. PERVINQUIÈRE, p. 43, f. 5. |

| | | |
|---|---|---|
| (1905) | — *Pecten striatopunctatus* Roemer | A. PÉRON, p. 364, 375, 373, 371. |
| (1905) | — *Pecten (Camptonectes) striato-punctatus* Roem. | E. HARBORT, p. 40. |
| 1912 | — *Pecten (Camptonectes) striato-punctatus* A. Roemer | L. PERVINQUIÈRE, p. 143. |
| 1912 | — *Pecten (Camptonectes) striatopunctatus* A. Roemer | A. WOLLEMANN, p. 156. |
| 1914 | — *Pecten (Camptonectes) striatopunctatus* Roem. | E. LANGE, pp. 208-209. |
| 1921 | — *Chlamys (Camptonectes) striato-punctatus* Roem. | S. GILLET, p. 92. |
| (1933) | — *Pecten arzierensis* de Lor. | A. HEIM, E. BAUMBERGER, S. FUSSENEGGER, p. 172. |
| (1933) | — *Pecten striatopunctatus* | A. BENOIT, p. 9. |
| (1939) | — *Camptonectes striato-costatus* (d'Orb.) (sic) | J. HOUDARD, p. 629. |
| v . 1939 | — *Pecten (Camptonectes) striato-punctatus* Römer | R. MARLIÈRE, pp. 96-97, pl. 6, f. 3. |
| 1947 | — *Camptonectes* cf. *striato-punctatus* Römer | J. V. L. RENNIE, pp. 61-62, pl. 3, f. 30, 31. |
| ? 1947 | — *Camptonectes* sp. | J. V. L. RENNIE, pp. 62-63, pl. 3, f. 32-33. |
| 1956 | — *Chlamys* cf. *striato-punctatus* (Roem.) | B. KOKOSZYNSKA, pp. 40-41. |
| ? (1957) | — *Pecten striatopunctatus* | W. HALLER, p. 133, pl. 20, f. 2 unten links. |
| ? 1957 | — *Pecten* sp. nov. | M. S. ERISTAVI, pp. 42-43, pl. 1, f. 7. |
| ? 1965a | — *Pecten (Camptonectes)* cf. *striato-punctatus* Roemer | S. CIESLINSKI, p. 29. |
| non 1925 | *Pecten (Camptonectes) striatopunctatus* J. P.J. RAVN = *Camptonectes virgatus* (Nilsson). | |

## Location of type-specimens

Roemer-Museum, Hildesheim (G. F. R.).
*Pecten arzierensis* : Muséum d'Histoire naturelle, Geneva (Switzerland).

Stratum typicum :

Hils (Neocomian)
*Pecten arzierensis* : Valangien (Valanginian).

Locus typicus :

Schöppenstedt, Braunschweig (G. F. R.)
*Pecten arzierensis* : Arzier (Canton de Vaud) (Switzerland).

## Original description

« P. (Arcuatus) testa orbiculata convexo-plana striis radiantibus arcuatis creberrimis grosso punctatis minoribus alternis, interstitiis latioribus iterum iterumque dichotomis concentrice subtilissime striatis.

Gehört, wie auch die vorhergehende Form [i.e. *Pecten buchii* 1839 F. A. ROEMER, p. 26, pl. 13, f. 8 (verkehrt) (sic)] zu den Arcuaten. Die kreisrunden Schalen sind sehr flach gewölbt und mit zahlreichen ausstrahlenden Streifen bedeckt, in denen man grosse Puncte sieht. Ihre Zwischenräume sind etwas breiter, wiederholt dichotom und von zarten concentrischen Streifen bedeckt. Findet sich nur im Hilse, bei Schandelahe, Schöppenstedt und im Elligserbrinke. Auch aus der Form der Ohren und dem Umfange der Schalen scheinen noch Unterscheide dieser drei (i.e. *Pecten lens* SOWERBY, *Pecten buchii* ROEMER, *Pecten striatopunctatus* ROEMER), bislang verwechselten Formen hergenommen werden zu können. »

*Pecten arzierensis*

« Dimensions :

Largeur : 15 à 47 mm.
Longueur, par rapport à la largeur, moyenne : 0,90.
Epaisseur, par rapport à la largeur, moyenne : 0,35.
Angle apical : 90°.

Coquille ovale, allongée, plus haute que longue, à peu près équivalve, la valve supérieure étant à peine un peu plus bombée que l'autre. La surface paraît presque lisse; avec le secours de la loupe, on s'aperçoit qu'elle est couverte d'une infinité de petites stries rayonnantes, extrêmement fines, un peu plus larges que leurs intervalles; ceux-ci ne se dichotomisent presque pas. Ces stries divergentes sont coupées par une infinité de stries concentriques d'une finesse extraordinaire, visibles seulement sur les individus parfaitement frais, mais laissant toujours dans les premières une impression qui les fait paraître ponctuées; sur un exemplaire de 25 mm de largeur j'ai pu compter au pourtour 260 stries rayonnantes. Oreillettes très inégales; les anales sont beaucoup plus petites et treillissées, la buccale de la valve inférieure est pourvue de forts plis d'accroissement.

Rapports et différences. Cette espèce, voisine du *P. striato-punctatus* ROEMER, s'en distingue cependant par sa forme moins orbiculaire, toujours moins longue que large, par son test très mince et non assez épais, ainsi que ROEMER l'indique, par ses stries rayonnantes encore plus fines et plus nombreuses, presque invisibles à l'œil nu, dont les intervalles à peine plus larges ne sont presque pas dichotomes, et enfin par ses stries concentriques plus serrées; elle diffère du *P. Cottaldinus* D'ORB. par ses stries rayonnantes, ponctuées, très-fines, nombreuses, serrées et non simples et écartées, ainsi que par la présence de stries concentriques extrêmement fines. Le *P. Arzierensis* paraît soumis à fort peu de variations. J'ai pu en examiner un grand nombre d'exemplaires, et il ne m'a pas été possible d'observer entre eux aucune modification sensible.

Gisement. Rare dans la couche A, très commun dans la couche B. »

## Additional description

Number of specimens studied : 125

| | |
|---|---|
| British Neocomian ... ... ... ... ... ... ... | 4 |
| French Neocomian ... ... ... ... ... ... ... | 11 |
| German Neocomian... ... ... ... ... ... ... | 12 |
| Swiss Neocomian ... ... ... ... ... ... ... | 51 |
| British Aptian ... ... ... ... ... ... ... ... | 28 |
| French Aptian ... ... ... ... ... ... ... ... | 5 |
| Belgian Albian ... ... ... ... ... ... ... ... | 11 |
| French Albian ... ... ... ... ... ... ... ... | 3 |

Measurements :

The only almost completely preserved specimens which I studied of *C. striatopunctatus* are those figured and described by H. WOODS. The complete specimens are usually fairly small, but incomplete specimens or fragments of larger specimens show clearly that on several specimens U. P. D. must have equalled ± 60 mm. On small specimens U. P. D. = ± 1.2 W. but on larger specimens the differential ratio increases. A.A. varies from almost rectangular to slightly obtuse.

Description :

Diagnosis. — Small to medium-sized, smooth, rather flattened *Camptonectes* species, with narrow umbo, an ovoid shape, and a wing-like and elongated anterior right auricle.

The only ornamentation is the *Camptonectes*-sculpture; near the umbo it is very fine and the punctae can only be seen with magnifying instruments. On the areas and on the auricles the punctae are larger and the sculpture is easily visible; this can be explained partly by the fact that the diverging striae lie further apart near the areas and the punctae too. The valves are more flattened than in most *Camptonectes* species; the auricles are relatively large; the apical margins are long.

Right valve : anterior auricle is elongated and winglike with a deep byssal sinus, and the delimitating apical margin is slightly concave; posterior auricle almost equilateral. The posterior apical margin is slightly shorter than the anterior margin.

Left valve : posterior auricle : right outer angle and straight or slightly concave outer margin.

Anterior auricle : smaller and rectangular to obtuse.

## Discussion

Variability :

The main variable characteristic in *C. striatopunctatus* is the sculpture : it varies from numerous very fine punctae to fewer punctae lying further apart and visible to the naked eye. This latter type of sculpture is very close to the finest sculpture of *C. virgatus* (NILSSON, S., 1827) (see under *C. virgatus* for PERVINQUIÈRE's opinion on this matter).

The specimens with very fine sculpture were described as *P. arzierensis* by P. DE LORIOL.

It is impossible to state the difference in punctae numerically because the visibility of the punctae depends on their size, their place on the disc and the state of preservation of the shell (on poorly preserved specimens no punctae can be seen on the middle parts of the discs).

According to P. DE LORIOL the diverging, punctae-bearing striae rarely divide in *Pecten arzierensis*. Indeed on types and topotypes it is true that the striae do not divide as frequently as they do on specimens with coarser

ornamentation. It could be that this is a local variation but there seems no reason to consider it to be outside normal variability.

Synonymy :

*C. striatopunctatus* is easily distinguishable from other *Camptonectes* species; hence little confusion arose in its synonymy.

There seems to be no doubt that DE LORIOL's species *(P. arzierensis)* is synonymous with *C. striatopunctatus*.

Differentiation :

*C. striatopunctatus* is the only Lower Cretaceous *Camptonectes* species without concentric ornamentation and is thus easily differentiated.

Confusion could arise with *C. virgatus*-specimens with fine sculpture : however, *C. virgatus* valves are more convex and the punctae-bearing striae lie deeper in the discs. Unfortunately these characteristics cannot be used on poorly preserved specimens.

Poorly preserved *C. cottaldinus*-specimens cannot easily be differentiated from *C. striatopunctatus*, especially when the auricles are missing (see under *C. cottaldinus*).

The differentiation towards the other Cretaceous *Camptonectes*-species can be made by using the same characteristics as under *C. (Boreionectes) cinctus*.

Generic attribution :

*Pecten striatopunctatus* ROEMER, F. A. 1839, is similar to *Pecten lens* J. SOWERBY, the type-species of *Camptonectes* (AGASSIZ *in* MEEK); hence its correct name should be *Camptonectes (Camptonectes) striatopunctatus* (ROEMER, F. A., 1839).

## Stratigraphical and geographical distribution

Valanginian : FRANCE :

Mièges (Jura) (Mus. Gen.)
Villers-le-Lac (Doubs) (Univ. Neuch.)

SWITZERLAND :

Arzier (Vaud) (Mus. Gen. also orig. DE LORIOL, Mus. Laus.)
Auberson, Sainte Croix (Vaud) (Mus. Laus.)
Locle (Neuchâtel) (Univ. Neuch.)
Sainte Croix (Vaud) (Mus. Gen., Mus. Laus., Univ. Neuch.)

Hauterivian : GREAT BRITAIN :

Lower Hauterivian : Claxby Ironstone :
Benniworth Haven (S. M. orig. WOODS, pl. 29, f. 6)

SWITZERLAND :

Chamblon (Vaud) (Mus. Laus.)
Colas, Sainte Croix (Vaud) (Mus. Laus.)
Les Liadets, Vallée de la Chaux (Neuchâtel) (Univ. Neuch.)

Barremian : SWITZERLAND :

Mormont (Vaud) (Mus. Laus.)

Neocomian (no further stratigraphical specification) :

FRANCE :

Auxerre (Yonne) (Ec. Min.)
Egriselles (Yonne) (Mus. Gen.)
Morteau (Doubs) (Mus. Gen.)
Villers-le-Lac (Doubs) (Mus. Gen.)

G. F. R. :

Elligser Brink, Ahlfeld (Niedersachsen) (B., Ec. Min., Halle, KO.)
Hannover (Mus. Gen., Musé. also coll. D'ORBIGNY)
Haverlahwiese, Salzgitter (Halle)
Osterwalde (B.)

GREAT BRITAIN :

Speeton Clay : Speeton (Yorks.) (S. M.)

SWITZERLAND :

Cressier (Neuchâtel) (Mus. Gen.)
Landeron (Vaud) (Mus. Gen.)
Sainte Croix (Vaud) (Mus. Gen.)

Aptian : FRANCE :

Saint-Dizier (Haute-Marne) (Musé.)

GREAT BRITAIN :

East Shalford (Surrey) (S. M.)

Albian : BELGIUM :

Meule de Bracquegnies :

Bracquegnies (Hainaut)
(B. M., I. R. Sc. N. B. also orig. R. MARLIÈRE, 1939.)

FRANCE :

Perte-du-Rhône (Ain) (Mus. Laus.)

## Camptonectes (Camptonectes) virgatus (S. NILSSON, 1827)

Pl. II, fig. 1a-c

| | | |
|---|---|---|
| v . 1820 — | *Pectinites excentricus* | E. T. VON SCHLOTHEIM, p. 228 (nomen oblitum). |
| v . 1827 — | *Pecten virgatus* n. | S. NILSSON, p. 22, pl. 9, f. 15. |
| v . 1827 — | *Pecten arcuatus* | S. NILSSON, p. 22, pl. 9, f. 14. |
| (non 1819 | *Pecten arcuatus* SOWERBY) | |

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|---|---|---|
| . 1835 | — *Pecten arcuatus* | A. GOLDFUSS, p. 50, pl. 91, f. 6a-b. |
| v . 1839 | — *Pecten arcuatus* | H. B. GEINITZ, p. 21. |
| (1839) | — *Pecten arcuatus* | A. D'ARCHIAC. p. 269. |
| 1841 | — *Pecten arcuatus* | F. A. ROEMER, p. 51. |
| 1842 | — *Pecten Jugleri* Nob. | F. VON HAGENOW, p. 554. |
| ? 1842 | — *Pecten striato-punctatus* | H. B. GEINITZ, p. 83. |
| v . 1843 | — *Pecten curvatus* m. | H. B. GEINITZ, p. 16, pl. 3, f. 13. |
| 1846 | — *Pecten arcuatus* | A. E. REUSS, p. 27, pl. 39, f. 7. |
| . 1846 | — *Pecten divaricatus* Reuss | A. E. REUSS, p. 28, pl. 39, f. 6. |
| (1846) | — *Pecten curvatus* | H. B. GEINITZ, p. 468. |
| v . 1846 | — *Pecten virgatus* Nilss. | E. FORBES, p. 154, pl. 15, f. 22. |
| 1847 | — *Pecten arcuatus* | J. MUELLER, p. 32. |
| v . 1847 | — *Pecten divaricatus* Reuss | J. MUELLER, p. 32. |
| v . 1847 | — *Pecten virgatus* Nilsson | A. D'ORBIGNY, p. 602, pl. 434, f. 7-10. |
| (1849) | — *Pecten curvatus* Gein. | H. G. BRONN, p. 250. |
| (1850) | — *Pecten virgatus* Nilsson | H. B. GEINITZ, p. 180. |
| (1850) | — *Pecten curvatus* Gein. | H. B. GEINITZ, p. 180. |
| (1850) | — *Pecten virgatus* Nilsson | A. D'ORBIGNY, p. 168. |
| (1850) | — *Pecten curvatus* Geinitz | A. D'ORBIGNY, p. 197 |
| (1850) | — *Pecten divaricatus* Reuss | A. D'ORBIGNY, p. 252. |
| (1850) | — *Pecten concentrice-punctatus* Reuss | A. D'ORBIGNY, p. 252. |
| (1850) | — *Pecten subvirgatus* d'Orb. | A. D'ORBIGNY, p. 253. |
| . 1850 | — *Pecten Besseri* m. | A. ALTH, p. 246, pl. 12, f. 30. |
| (non 1830 | *Pecten Besseri* | A. ANDREZEJOWSKI, Bull. Soc. Imp. Nat. Moscou II, 1, p. 103 (fide SHERBORN)). |
| (1852) | — *Pecten virgatus* Nilsson | C. G. GIEBEL, p. 351. |
| (1854) | — *Pecten virgatus* Nilss. | A. E. REUSS, p. 51. |
| (1854) | — *Pecten virgatus* Nilsson | J. MORRIS, p. 177. |
| 1855 | — *Pecten* sp. allied to *Pecten virgatus* | W. BAILY, p. 462. |
| (1859) | — *Pecten divaricatus* Reuss | J. T. BINKHORST VAN DEN BINKHORST, p. 134. |
| 1859 | — *Pecten virgatus* Nilss. | H. COQUAND, p. 958. |
| (1860) | — *Pecten virgatus ?* Nilss. | J. BOSQUET, n° 477. |
| (1860) | — *Pecten divaricatus* Nilss. | J. BOSQUET, n° 478. |
| (1861) | — *Pecten Texanus* Gabb | W. GABB, p. 217. |
| 1862 | — *Pecten virgatus* Nilss. | H. COQUAND, p. 299. |
| v . 1863 | — *Pecten virgatus* Nilss. | R. DRESCHER, p. 353. |
| v . 1866 | — *Pecten virgatus* Nilss. | K. A. ZITTEL, pp. 109-111, pl. 17, f. 8a-c. |
| (1866) | — *Pecten arcuatus* Sow. | C. GIEBEL, p. 47. |
| 1869 | — *Pecten Althi* E. Favre | E. FAVRE, p. 154. |

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|---|---|---|
| 1870 | — *Pecten virgatus* Nilsson | F. ROEMER, p. 333. |
| ? 1870 | — *Pecten divaricatus* Reuss | F. J. PICTET & G. CAMPICHE, p. 217. |
| 1870 | — *Pecten curvatus* Gein. | F. J. PICTET & G. CAMPICHE, p. 217. |
| . 1871 | — *Pecten (Camptonectes) curvatus* Geinitz | F. STOLICZKA, p. 433, pl. 31, f. 15-16, pl. 41, f. 4-6. |
| (1871) | — *Pecten (Camptonectes) virgatus* Nilss. | F. STOLICZKA, p. 428. |
| v . 1872 | — *Pecten curvatus* Gein. | H. B. GEINITZ, p. 193, pl. 43, f. 15. |
| v . 1875 | — *Pecten curvatus* Gein. | H. B. GEINITZ, p. 33, pl. 10, f. 1. |
| (1875) | — *Pecten virgatus* Nils. | H. ARNAUD, p. 32. |
| 1876 | — *Pecten (Camptonectes) virgatus* Nilsson | D. BRAUNS, p. 390. |
| ? 1877 | — *Pecten curvatus* Gein. | A. FRITSCH, p. 136, f. 127. |
| 1882 | — *Pecten virgatus* Nilss. | H. SCHROEDER, p. 270. |
| ? 1883 | — *Pecten curvatus* Gein. | A. FRITSCH, p. 116. |
| ? 1885 | — *Pecten (Camptonectes) concentrice-punctatus* Reuss | F. NÖTLING, p. 16, pl. 2, f. 6-6a. |
| 1885 | — *Pecten (Camptonectes) divaricatus* Reuss | F. NÖTLING, p. 17, pl. 2, f. 5, 5a, 5b. |
| 1885 | — *Camptonectes curvatus* Geinitz sp. | J. BOEHM, p. 78. |
| v . 1887 | — *Pecten (Camptonectes) curvatus* Geinitz | F. FRECH, p. 155, pl. 19, f. 18. |
| 1888 | — *Pecten (Camptonectes) virgatus* Nilss. | G. MUELLER, p. 408. |
| (1888) | — *Pecten curvatus* Gein. | F. E. GEINITZ, p. 737, 743. |
| . 1889 | — *Pecten virgatus* Nilss. | E. HOLZAPFEL, p. 229, pl. 26, f. 7-9. |
| . 1889 | — *Pecten fulminifer* n. sp. | E. HOLZAPFEL, pp. 230-231, pl. 26, f. 14-15. |
| 1889 | — *Pecten (Camptonectes) virgatus* Nilsson | O. GRIEPENKERL, p. 46. |
| ? 1889 | — *Pecten curvatus* Gein. | A. FRITSCH, p. 85. |
| 1892 | — *Pecten virgatus* Nilsson | F. VOGEL, p. 55. |
| 1893 | — *Pecten* sp. cf. *curvatus* Gein. | R. MICHAEL, p. 236. |
| ? 1893 | — *Pecten curvatus* Gein. | A. FRITSCH, p. 100. |
| . 1894 | — *Pecten arcuatus* Sow. | A. HENNIG, p. 519. |
| . 1895 | — *Pecten (Camptonectes) virgatus* Nilsson | F. VOGEL, p. 23. |
| 1896 | — *Pecten virgatus* Nilss. | A. RUTOT, p. 10, p. 30. |
| ? 1897 | — *Pecten virgatus* Nilss. | A. FRITSCH, p. 68. |
| v . 1897 | — *Pecten virgatus* Nilsson | A. HENNIG, p. 41, pl. 2, f. 28, 33. |
| 1897 | — *Pecten virgatus* Nilss. | R. LEONHARD, p. 26. |
| (1897) | — *Pecten virgatus* | W. F. HUME, p. 555. |

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|---|---|---|
| . 1898 | — *Pecten virgatus* Nilss. | G. MUELLER, p. 33. |
| (1899) | — *Pecten virgatus* Nilss. | G. BODE, p. 155. |
| 1900 | — *Pecten virgatus* Nilsson | C. GAGEL & F. KAUNHOWEN, p. 231. |
| (1900) | — *Pecten curvatus* Gein. | J. V. ZELIZKO, p. 534, 535, 536, 541, 542. |
| 1901 | — *Pecten virgatus* Nilss. | F. STURM, p. 90. |
| (1901) | — *Pecten virgatus* | C. ZAHALKA, p. 98. |
| (1901) | — *Pecten virgatus* Nilsson | A. MICHALET, p. 582. |
| v . 1902 | — *Pecten (Camptonectes) curvatus* Geinitz | H. WOODS, p. 159, pl. 29, f. 7a-b, pl. 37, f. 16. |
| 1903 | — *Pecten virgatus* Nilsson | J. P. J. RAVN, p. 84. |
| 1903 | — *Pecten virgatus* Nilsson | L. PERVINQUIÈRE, p. 112, 151. |
| (1904) | — *Pecten virgatus* Nilss. | W. PETRASCHECK, p. 4. |
| (1905) | — *Pecten curvatus* Gein. | J. J. JAHN, p. 77. |
| 1905 | — *Pecten virgatus* Nils. | W. KOEHNE, p. 332. |
| 1905 | — *Pecten virgatus* Nilss. | T. WEGNER, p. 174. |
| . 1906 | — *Pecten (Camptonectes) Kalkowskyi* nov. spec. | W. PETRASCHECK, p. 431, pl. 10, f. 1-4. |
| 1906 | — *Pecten virgatus* Nilss. | W. PETRASCHECK, p. 411. |
| . 1906 | — *Pecten (Camptonectes)* sp. | H. WOODS, pp. 297-298, pl. 35, f. 12a-b, 13. |
| 1907 | — *Camptonectes* cf. *curvatus* (Geinitz) | R. B. NEWTON, p. 284, pl. 24, f. 15. |
| . 1909a | — *Pecten (Camptonectes) virgatus* Nilss. | W. ROGALA, p. 695. |
| v . 1910 | — *Camptonectes* cf. *curvatus* Geinitz | R. B. NEWTON, pp. 60-61, pl. 3, f. 5, 6. |
| (1911) | — *Pecten (Camptonectes) virgatus* Nilss. | W. ROGALA, p. 493. |
| ? 1911 | — *Pecten* cfr. *striatopunctatus* Röm. | K. VOGEL VON FALCKENSTEIN, p. 554. |
| 1911 | — *Pecten curvatus* Gein. | K. VOGEL VON FALCKENSTEIN, p. 553. |
| . 1912 | — *Pecten (Camptonectes) virgatus* Nilsson | L. PERVINQUIÈRE, p. 143. |
| 1913 | — *Pecten (Camptonectes) virgatus* Nils. | H. SCUPIN, p. 221. |
| (1913) | — *Pecten curvatus* Gein. | E. SPENGLER, p. 237. |
| v . 1918 | — *Pecten (Camptonectes) curvatus* Gein. | J. P. J. RAVN, p. 25, pl. 2, f. 6. |
| 1920 | — *Camptonectes* af. *virgatus* Nilson | F. ROMAN & F. MAZERAN, p. 90, pl. 9, f. 10. |
| (1922) | — *Pecten (Camptonectes) curvatus* Geinitz | G. W. LAMPLUGH, p. 48. |
| . 1922 | — *Pecten virgatus* Nilss. | W. KOEPLITZ, p. 36. |
| (1924) | — *Pecten divaricatus* Reuss | M. SCHLOSSER, p. 87. |
| (1924) | — *Pecten virgatus* Nilss. | L. LEHNER, p. 177, 180. |
| v . 1924 | — *Camptonectes* cf. *virgatus* (Forbes) | R. B. NEWTON, p. 148. |

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| v . 1925 | — *Pecten (Camptonectes) striatopunctatus* | J. P. J. RAVN, p. 30, pl. 1, f. 6. |
| v . 1927 | — *Camptonectes* cf. *curvatus* Gein. | C. T. TRECHMANN, p. 34, pl. 3, f. 7, 8. |
| (1928) | — *Pecten (Camptonectes) curvatus* Gein. | J. MACHACEK, p. 447, 449, 451, 452. |
| ? 1929 | — *Camptonectes* sp. | C. T. TRECHMANN, p. 487, pl. 18, f. 7. |
| . 1929 | — *Camptonectes* cf. *curvatus* Gein. | C. T. TRECHMANN, p. 487. |
| . 1930 | — *Pecten (Camptonectes) kaffraria* sp. nov. | J. V. L. RENNIE, pp. 178-179, pl. 16, f. 12-15. |
| 1931 | — *Pecten (Camptonectes) curvatus* Gein. | L. NOETH, p. 335. |
| v . 1932 | — *Pecten (Syncyclonema) jugleri* v. Hagenow | D. WOLANSKY, p. 19, pl. 2, f. 14. |
| . 1933 | — *Pecten (Camptonectes) virgatus* Nilss. | W. HAENTZSCHEL, p. 129, pl. 4, f. 15-16. |
| 1933 | — *Pecten (Camptonectes) virgatus* Nilss. var. *Kalkowskyi* Petr. | W. HAENTZSCHEL, p. 130. |
| (1933) | — *Pecten virgatus* Nilss. | E. SCHOENFELDER, p. 103. |
| v (p.p.) . 1934 | — *Pecten (Camptonectes) virgatus* Nilss. | H. ANDERT, pp. 156-159, pl. 9, f. 3-5. |
| ? 1934 | — *Pecten (Camptonectes) hierichuntinus* n. sp. | M. BLANCKENHORN, p. 188. |
| (1934) | — *Pecten (Camptonectes) virgatus* Gein. | V. ZAZVORKA & J. SOUKUP, p. 208, 209. |
| (1934) | — *Pecten virgatus* Nilss. | ST. T. JELEV, p. 186. |
| (1935) | — *Pecten curvatus* Geinitz | M. MARCHETTI, p. 26, 27. |
| . 1936 | — *Camptonectes* cf. *curvatus* (Geinitz) | J. V. L. RENNIE, p. 336, pl. 15, f. 1-2. |
| 1937 | — *Pecten (Camptonectes) virgatus* Nilss. | E. BEYENBURG, p. 302. |
| 1937 | — *Pecten (Camptonectes) virgatus* Nilsson | L. LEHNER, p. 184. |
| v . 1937 | — *Pecten (Camptonectes) virgatus* Nills. var. *occultestriatus* Zittel | L. LEHNER, p. 185, pl. 23, f. 6a-b. |
| (1938) | — *Pecten virgatus* Nilss. | W. POZARYSKI, p. 22. |
| v . 1939 | — *Pecten (Camptonectes) virgatus* Nils. | E. DACQUÉ, p. 125, pl. 16, f. 6. |
| . 1940 | — *Camptonectes woodsi* nov. sp. | G. TAVANI, p. 50, pl. 1, f. 3. |
| 1940 | — *Pecten curvatus* Geinitz | R. HÄGG, p. 220. |
| ? 1940 | — *Syncyclonema jugleri* v. Hagenow | V. TZANKOV, p. 487, pl. 6, f. 5. |
| . 1940 | — *Comptonectes virgatus* Nillsson | V. TZANKOV, p. 488, pl. 6, f. 7. |
| . 1941 | — *Pecten (Syncyclonema) jugleri* v. Hag. | E. STOLL, p. 94, pl. 2, f. 8. |

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| 1943 | — *Pecten fulminifer* Holzapfel | W. J. M. VAN DER WEIJDEN, p. 83, pl. 7, f. 11. |
| . 1943 | — *Pecten (Camptonectes) virgatus* Nilsson | W. J. M. VAN DER WEIJDEN, p. 86, pl. 9, f. 6-7. |
| ? 1945 | — *Pecten (Camptonectes)* cf. *virgatus* Nilsson | J. V. L. RENNIE, pp. 28-29, pl. 2, f. 5. |
| 1947 | — *Pecten (Camptonectes) virgatus* Nilsson | R. HÄGG, p. 69. |
| 1948 | — *Camptonectes virgatus* Nilsson | G. TAVANI, p. 97. |
| . 1949 | — *Camptonectes virgatus* (Nilss.) | E. NALDINI, p. 89. |
| ? 1952 | — *Chlamys (Camptonectes) virgata* Nilsson sp. | F. TESSIER, pp. 320-321, pl. 20, f. 1-2. |
| (1953)a | — *Pecten virgatus* Nilss. | J. F. DVORAK, p. 29. |
| (1953)b | — *Pecten (Camptonectes) virgatus* Nilss. | J. F. DVORAK, p. 528, 531, 533. |
| v . 1953 | — *Pecten (Camptonectes) virgatus* Nilss. | H. PRESCHER, p. 254, 256. |
| 1954 | — *Pecten (Camptonectes) virgatus* Nilsson | R. HÄGG, p. 39. |
| (1956) | — *Pecten curvatus* Gein. | K. A. TROEGER, p. 54, 90. |
| v ? 1957 | — *Pecten (Camptonectes)* cf. *curvatus* Geinitz | R. A. REYMENT, p. 42. |
| . 1957 | — *Camptonectes virgatus* (Nilsson) var. *kaffraria* Rennie | E. DARTEVELLE & S. FRENEIX, p. 70, pl. 9, f. 3-7. |
| ? 1958 | — *Camptonectes spec.* | S. FRENEIX, p. 161, pl. 1, f. 4. |
| . 1960 | — *Camptonectes spec.* (groupe de *C. virgatus* Nilsson) | S. FRENEIX, p. 29, pl. 2, f. 3a-b. |
| (1960) | — *Pecten (Camptonectes) virgatus* Nilss. | K. A. TROEGER & L. WOLF, p. 291. |
| (1964)a | — *Pecten (Camptonectes) virgatus* Nilss. | H. ARNOLD, p. 98, 100, 104. |
| (1964)b | — *Pecten (Camptonectes) curvatus* Gein. | H. ARNOLD, p. 207. |
| (1964)c | — *Pecten (Campt.) curvatus* Gein. | H. ARNOLD, p. 317. |
| (1964)c | — *Pecten (Campt.) virgatus* Nilss. | H. ARNOLD, p. 317. |
| ? (1964)c | — *Pecten (Sync.) jugleri* Hag. | H. ARNOLD, p. 317. |
| (1966) | — *Pecten virgatus* Lam. (sic) | S. L. BENKÖ, p. 73. |
| . 1968 | — *Chlamys (Camptonectes) virgata* (Nilsson) | S. I. PASTERNAK et al., p. 167, pl. 35, f. 6-8. |

## Location of type-specimens

Holotype. — Originalsamling LO 74 t, Palaeontologiska Institutionen, Lund University (Sweden).

*Pecten excentricus* VON SCHLOTHEIM : Museum der von Humboldt Universität, Berlin (G. D. R.)
*Pecten curvatus* GEINITZ : Staatliches Museum für Geologie und Mineralogie, Dresden (G. D. R.)
*Pecten jugleri* VON HAGENOW : destroyed, was kept in the Museum of Szczecin, (Poland). Many topotypes in the Rügen collections of the University of Greifswald (G. D. R.)
*Pecten divaricatus* REUSS : lost, was kept in the Museum in Budapest (Hungary); some topotypes in the collections of the Naturhistorisches Museum, Vienna (Austria)
*Pecten besseri* ALTH : lost; apart from a few specimens in the Museum in Vienna, the ALTH-collection seems completely lost for science
*Pecten fulminifer* HOLZAPFEL : see in « Synonymy »
*Pecten kalkowskyi* PETRASCHECK : cannot be found in the Geologische Bundesanstalt in Vienna where it was originally; it is likely that it is at present in the National Museum in Prague : all the specimens from Czechoslovakia kept previously in the Geologische Bundesanstalt were taken to Prague after the Second World War.
*Pecten kaffraria* RENNIE : a name for *Pecten (Camptonectes)* sp. WOODS, 1906 : the type-material is in the Transvaal Museum, Pretoria (South Africa).
*Camptonectes woodsi* TAVANI : a name for the same reference in WOODS, 1906 (p. 297)
*Pecten hierichuntinus* BLANCKENHORN : Hebrew University of Jerusalem (Israel).

Locus typicus :

Mörby (Sweden) (designated by HENNIG, 1897)
*Pecten excentricus* : Aachen (O. D.) (G. F. R.)
*Pecten curvatus* : Kieslingswalda (O. D.) (Poland)
*Pecten jugleri* : Rügen (O. D.) (G. D. R.)
*Pecten divaricatus* : Tržiblitz (Czechoslovakia)
*Pecten besseri* : Lemberg (Lwow) (O. D.) (U. S. S. R.)
*Pecten fulminifer* : Vaals (O. D.) (The Netherlands)
*Pecten kalkowskyi* : Zohsec, Landskron i. Böhmen (O. D.) (Czechoslovakia)
*Pecten kaffraria* : Pondoland (O. D.) (S. A. U.)
*Pecten woodsi* : id.
*Pecten hierichuntinus* : Jericho (O. D.) (Jordan).

Stratum typicum :

In formatione cretacea (here : Upper Campanian)
*Pecten excentricus* : Sandstein von Aachen (Campanian)
*Pecten curvatus* : (Campanian ?)
*Pecten jugleri* : (Lower Maastrichtian)

*Pecten divaricatus* : Plänersandstein (Turonian)
*Pecten besseri* : Kreidemergel (Upper Maastrichtian)
*Pecten fulminifer* : Grünsand (Campanian)
*Pecten kalkowskyi : A. plenus* zone (Lowermost Turonian)
*Pecten kaffraria* : Cretaceous (very probably Turonian-Senonian)
*Pecten hierichuntinus* : Santon (Santonian).

## Original description

« P. testa suborbiculari convexiuscula, striata; striis mediis ramosis per dichotomiam sensim divisis, lateralibus divergentibus arcuatis; auriculis inaequalibus reticulato-striatis. Diam. 12-18 mm.

Parvulus hic Pectinites inter pulcherrimos est eorum qui in formatione cretacea obveniunt. Quoad formam et magnitudinem similis est *Pectini pulchello*; costulae parvae frequentissimae subrugosae, in media testa longitudinales, ramosae, per dichotomiam sensim multiplicatae; juxta latera vero magis arcuatae. Auriculae inaequales, reticulatim striatae; margine rostri altero recto, altero concavo.

Locus. — Obvenit ad Balsberg et Mörby; sed inter rariores esse videtur. »

*Pecten excentricus*

« In Sandstein von *Aachen* eingewachsen, und aufliegend, mit zum Theil erhaltener und versteinerter Schaale (6 Ex.).

Unterscheidet sich durch seine, von der Mitte zu beyden Seiten auslaufenden, krumm gebogenen, zahlreichen linienförmigen Strahlen von den übrigen Pectiniten-Arten. Er hat einen mehr länglich runden Bau, und seine Ohren erscheinen auf der einen Seite ausgebogen. Er übersteigt schwehrlich die Grösse eines Zolls im Durchmesser, und findet sich ziemlich häufig. »

*Pecten jugleri*

« Halbkreis-förmig, gleichschaalig, fast gleichseitig, glatt, glänzend, ziemlich starkschaalig, aber sehr zerbrechlich. Drei bis vier konzentrische breite Anwachs-Streifen lagern zart Treppenartig über einander. Die vordere Schloss-Kante ist etwas konkav eingebuchtet, der hintere gerade. Der Schloss-Winkel oszillirt um 90°. Die vorderen ohren abgerundet rechtwinkelig und gleich gross, stark queergerippt, zuweilen auch etwas längsgestreift und dann fein gekörnt erscheinend; die hinteren Ohren, ebenfalls gleich gross und gerippt, treten nur als schmale abgerundete Läppchen vor. Länge 10‴, Breite 9‴. »

*Pecten curvatus*

« Schief-oval mit spitzem Wirbel, und nach ihm hin am stärkst gewölbt. Ohren ungleich; das eine stumpfwinkelig, das andere gerundet und unten tief ausgeschnitten. Oberfläche mit zahllosen, feinen, dem Rande zu gekrümmten Linien, zwischen welchen sich andere einlagern, und über welche insgesammt sehr feine dichte Anwachslinien gehen.

Durch längere Gestalt, spitzen Wirbel, durch die Beschaffenheit der ungleichen Ohren, so wie endlich durch die viel feineren und zahlreicheren Linien unterscheidet sich diese Art von *Pecten arcuatus* Sow., womit Römer (Kr. p. 51) die Exemplare von Kieslingswalda vereinigt. Die Original Abbildung von *P. arcuatus* bei Sowerby M. C. Tab. 205, fig. 7 hat übrigens noch mehr Aenlichkeit mit *P. curvatus* m. als alle späteren Abbildungen und die in Sachsen aufgefundene Exemplare, welche alle breiter und mit weniger Linien bedeckt sind. Kieslingswalda. »

*Pecten divaricatus*

« 5-10‴ hoch, breit-oval kreisförmig oder auch vollkommen kreisrund, sehr flach convex. Beiden Schlosskanten fast gleich, äusserst wenig eingebogen, in unmittelbarer Rundung in den Seitenrand übergehend. Buckel rechtwinklig oder nur sehr wenig stumpfwinkelig. Die Oberfläche mit weniger zahlreichen (70 bei 5,5‴ Höhe) und grösseren, dem freien Auge sehr deutlich sichtbaren, vertieften, an den Seiten bogenförmigen Radiallinien, die sich nach unten durch Einschiebung und Spaltung vermehren und deren 1 1/2-2 mal breitere Zwischenräume flach gewölbt sind. Ueber beide

laufen dichtere, vertiefte, konzentrische Linien, die besonders in der Nähe des Wirbels und an den Seiten dem freien Auge sichtbar sind. Sie punktiren nicht nur die Radialfurchen, sondern sind auch auf den gewölbten Zwischenräumen als vertiefte Linien sichtbar, die mitunder so tief werden, dass jene gekörnt erscheinen. Die Ohren der rechten Klappe rechtwinklig, das vordere etwas grösser; das vordere Ohr der linken Klappe gross, gerundet, an der Basis sehr tief eingebogen. Ihre Oberfläche ist stark konzentrisch und radial gestreift.

Häufig im Plänersandstein von Trziblitz, Schelkowitz, Hradek; selten im Plänermergel von Priesen, Hochpetsch, im Grünsandstein von Czencziz, Neuschloss, Malnitz; im Exogyrensandstein von Malnitz und Drahomischel; im obern Plänerkalk von Sauerbrunnberg bei Bilin und in Plänersandsteintrümmern aus dem Pyropen-führenden Konglomerate von Meronitz. »

*Pecten besseri*

« P. testa tenui, suborbiculari, compressa, radiatim tenuissima plicata, rostro obtusangulo, marginibus ejus subrectis, subaequalibus, ad quartam partem latitudinis testae solum decurrentibus, auriculis magnis, inaequalibus. Plicis testae numerosissimis, tenuissimis, interstitiis linearibus, lineis concentricis copiosis, parum conspicuis.

Länge und Breite = 15 Mill. Länge der Schlosskanten 9 Mill. Schlosskantenwinkel 100°. Länge der Schlosslinie 11 Mill. Fast kreisrund flach gewölbt, mit geraden, wenig über ein Viertel der Breite herabreichenden Schlosskanten, die an ihrem Ende gegen die Seitenkanten einen deutlichen Winkel bilden. Schlosskantenwinkel stumpf, der Wirbel selbst aber spitz. Schlosslinie fast so lang, wie die ganze Muschel, daher die Ohren gleichfalls lang, beide an der Basis augeschnitten. Die Schale dünn mit einer Menge sehr feiner (6 Falten auf ein Mill. Länge) einfacher Radialfalten mit linienförmigen Zwischenfurchen, welche jedoch trotz ihrer Feinheit auf den Steinkernen, obwohl undeutlich sichtbar bleiben, und daher wahre Falten sind. Undeutliche Zuwachsstreifen durchkreuzen dieselben.

Sehr selten im Kreidemergel von Lemberg. »

## Additional description

Number of specimens studied : 498.

| | |
|---|---|
| British Cenomanian ... ... ... ... ... ... ... | 2 |
| Czech Cenomanian ... ... ... ... ... ... ... | 4 |
| Danish Cenomanian ... ... ... ... ... ... | 2 |
| French Cenomanian ... ... ... ... ... ... ... | 15 |
| German Cenomanian ... ... ... ... ... ... | 16 |
| Polish Cenomanian ... ... ... ... ... ... ... | 2 |
| Austrian Turonian ... ... ... ... ... ... ... | 5 |
| Czech Turonian ... ... ... ... ... ... ... ... | 16 |
| Danish Turonian ... ... ... ... ... ... ... ... | 2 |
| German Turonian ... ... ... ... ... ... ... | 24 |
| Austrian Senonian ... ... ... ... ... ... ... | 6 |
| Czech Senonian ... ... ... ... ... ... ... ... | 17 |
| Danish Senonian ... ... ... ... ... ... ... ... | 3 |
| German Senonian ... ... ... ... ... ... ... | 18 |
| Indian Senonian ... ... ... ... ... ... ... ... | 3 |
| Polish Senonian ... ... ... ... ... ... ... ... | 12 |
| British Campanian ... ... ... ... ... ... ... | 5 |
| Dutch-German Campanian ... ... ... ... ... | 33 |
| Jamaican Campanian ... ... ... ... ... ... | 4 |
| Swedisch Campanian ... ... ... ... ... ... | 31 |
| Belgian-Dutch Maastrichtian ... ... ... ... | 193 |

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|---|---|
| Bulgarian Maastrichtian ... ... ... ... ... | 1 |
| Danish Maastrichtian ... ... ... ... ... ... | 5 |
| German Maastrichtian ... ... ... ... ... ... | 53 |
| Algerian Upper Cretaceous ... ... ... ... ... | 12 |
| Indian Upper Cretaceous ... ... ... ... ... | 2 |
| Jamaican Upper Cretaceous ... ... ... ... | 3 |
| South African Upper Cretaceous ... ... ... | 3 |
| Tunisian Upper Cretaceous ... ... ... ... ... | 6 |
| Upper Cretaceous from Mozambique ... ... | 2 |

Measurements :

n = 30; all specimens from the Maastrichtian type-strata :
U. P. D. varies from 8 mm to 23 mm; av. 15.5 mm.
W. varies from 7 mm to 22 mm; av. 13.9 mm.
A.A. varies from 80° to 104°; av. 94°.
Index U. P. D./W. varies from 1.000 to 1.474; av. 1.120.

Description :

Diagnosis. — Small to medium-sized *Camptonectes* species with orbicular, rather convex, acline valves with very unequal auricles.

Sculpture : consists of dichotomous radial striae which diverge from the umbo towards the pallial and side margins; they diverge from the middle of the disc more or less along the U. P. D.. The diverging striae are traversed by concentric growthlines. The complete shell surface is divided into small rectangles. At the intersection-points between concentric and diverging striae lie the *Camptonectes*-punctae. The number of striae ,both concentric and radial is extremely variable. The sculpture is the same on both valves.

Right valve : anterior auricle : winglike and elongated; the sculpture is the same as on the disc, but the radial striae are straight and almost parallel to the hinge margin; the concentric striae start at the margin, curve and follow the byssal sinus; the same sculpture is found on all the auricles, but it is not as clearly visible on the others. Posterior auricle : smaller, and obtuse at its outer angle.

Left valve : anterior auricle; almost rectangular at its outer angle; Posterior auricle : smaller and obtuse at its outer angle.

## Discussion

Variability :

The variability in size is very wide but, not equally so in all strata : in the Hervian (Campanian) near Aachen the largest specimens reach a U. P. D. of more than 35 mm but in Maastricht the largest specimens are only 25 mm high. Large specimens are also known from the Cenomanian Czech strata, but the Cenomanian French strata yield only small specimens.

Synonymy :

In the museum of the von Humboldt University of Berlin I saw the specimen labelled « Original von Schlotheim, *Pecten excentricus,* Petrefactenkunde ». It comes from Aachen; HENNIG, 1897 stated that it is a *Pecten virgatus* NILSSON.

In the Staatliches Museum in Dresden I saw the holotype of *Pecten curvatus* GEINITZ : GEINITZ's figure (pl. 3, fig. 13) is not like the type-specimen which is a « Steinkern » and which has little of the original sculpture left; as far as can be seen it is a *Camptonectes virgatus.*

The type-specimens of *Pecten jugleri* are lost. In the collections of the University of Greifswald many specimens from Rügen make an objective opinion possible of that taxon : all specimens from Rügen have auricles with a normal *C. virgatus* shape and sculpture. On most specimens, however, the discs seem smooth. On a few specimens the *C. virgatus*-ornamentation is visible near the side margin too. It seems that the Rügen specimens are typical *C. virgatus* specimens but that the discs are worn off, and the ornamentation only remains visible where it has always been more clearly visible, namely on the auricles and on the areas.

The original of *Pecten fulminifer* HOLZAPFEL is probably lost in the partial destruction of the « Preussische Geologische Landesanstalt » in Berlin during the Second World War. In the Muséum d'Histoire naturelle in Paris there is one specimen from the Hervian in Vaals (Coll. DE VIBRAYE) : it bears the elevated structures which HOLZAPFEL considered to be specific for *P. fulminifer.* On checking this specimen carefully I noticed that the elevated structure is the result of the silicification which took place after the fossilisation. The elevated parts can be very easily removed without damaging the fossil and what is left is a normal *C. virgatus.*

HOLZAPFEL pointed out that in *C. virgatus* the range of variability in size and sculpture is very wide. I came to the same conclusion; hence, I consider that *Pecten (Camptonectes) kalkowskyi* PETRASCHECK is a large *C. virgatus*; some *C. virgatus* specimens from Aachen almost reach the size given for *C. kalkowskyi* by PETRASCHECK.

The specimens described by LEHNER as *Pecten (Camptonectes) virgatus var. occultestriatus* (in the Bayerische Staatsammlung in Munich) are real *C. virgatus* by their shape and sculpture.

*Pecten divaricatus* REUSS and *Pecten besseri* ALTH (non ANDREZEJOWSKI) (= *P. althi* FAVRE) are within the variability range of *C. virgatus.*

This is also true for *Pecten (Camptonectes)* sp. WOODS, 1906 (= *Pecten kaffraria* RENNIE, 1930 and *Camptonectes woodsi* TAVANI, 1940 (objective synonyms), the sculpture is fine, much more so than on NILSSON's figures, but not very different from certain finely ornamented specimens from Maastricht. Most African specimens have a fine sculpture, and

thus it is probably true that they are a different « variety » as proposed by E. DARTEVELLE & S. FRENEIX *(C. virgatus var. kaffraria).*

A. VON KOENEN, 1897, described two species from the Cretaceous of Mungo in Cameroon which probably belong with *C. virgatus* : *Pecten productus* (p. 20, pl. 3, f. 17) and *P. kamerunensis* (p. 20, pl. 3, f. 14 a-b, 15 a-b).

*Pecten (Camptonectes)* cf. *curvatus* as described in R. A. REYMENT, pl. 7, f. 10, is in the B. M. (L 82956). It comes from the Odukpani-formation of the neighbourhood of Calabar (Nigeria). It is very badly preserved and cannot be determined specifically. It is a *Camptonectes* because some parts have retained the typical ornamentation.

*Pecten projectus* TATE, 1867 (p. 155, pl. 9, f. 6) from the South African Upper Cretaceous is probably a *C. virgatus*; no decision can be reached without the original or topotypical material.

*Pecten concentricepunctatus* REUSS, 1845 (p. 28, pl. 39, f. 8) : undoubtedly a *Camptonectes* species with very fine sculpture; whether this species is specifically different from finely ornamented *C. virgatus* (NILSSON) or from *C. striatopunctatus* (ROEMER) I have not been able to decide.

*Pecten occultestriatus* ZITTEL, 1866 (p. 109, pl. 17, f. 6 a-c) seems to be identical with the preceding taxon and the problem is the same. ZITTEL's type-material is in Vienna (fig. 6 a & c in the Geologische Bundesanstalt and f. 6 b in the Naturhistorisches Museum).

On specimens of *C. virgatus* from Edward's Pit, Mousehold, Norwich, *B. mucronata* zone (B. M.) and from Balsberg (Sweden), Campanian (Lund) a concentric, slightly elevated macrosculpture is visible; these concentric ridges could here too be the result of the fossilisation process.

In the North American Cretaceous several species have been described which closely resemble *C. virgatus.*

A few examples :

*Camptonectes burlingtonensis* (GABB, 1860) see B. WADE, 1926, p. 63, pl. 20, f. 5, 6, 10, 11) has a more pronounced concentric ornamentation than on most *C. virgatus*-specimens.

*C. argillensis* (CONRAD, 1860) see B. WADE, 1926, p. 62, pl. 20, f. 8, 9) : on figures this species cannot be differentiated from specimens of *C. virgatus* from Norwich and Balsberg.

Both species are from the Campanian-Maastrichtian.

*C. martinensis* (STEPHENSON, 1952, p. 80, pl. 19, f. 1-4)

*C. ellsworthensis* (STEPHENSON, 1952, p. 80, pl. 19, f. 5, 6)

*C. moodyi* (STEPHENSON, 1952, p. 79, pl. 19, f. 8, 9)

These 3 species are from the Texan Cenomanian; from the descriptions and figures no real specific differences can be found and they seem to be almost identical with the specimens from Le Mans (also Cenomanian).

Differentiation :

*C. virgatus* and *C. striatopunctatus* are very similar and likely to be very closely related; *C. virgatus* is probably the direct descendant of *C. striatopunctatus.*

*C. striatopunctatus* dies out at the end of the Albian and *C. virgatus* appears at the beginning of the Cenomanian.

The main difference between the two species is that the average *C. striatopunctatus* has a much finer and less clearly visible ornamentation : on most specimens it is only visible under magnification.

As an illustration of the grade of difference between *C. virgatus* and *C. striatopunctatus* PERVINQUIÈRE's, 1912 opinion is reproduced :

« Avec ZITTEL et HOLZAPFEL, j'estime qu'il est impossible de séparer les formes cénomaniennes des sénoniennes; d'autre part, il y a tous les passages entre le mode à côtes très fines et le mode à côtes relativement larges. Bien des Mollusques actuels nous montrent, au sein de la même espèce, des différences comparables à celles qu'on observe entre formes du Crétacé supérieur, et même entre celle-ci et *P. striato-punctatus.* Au fond, c'est la même espèce qui a vécu pendant tout le Crétacé ».

*C. virgatus* is the only species with *C. ? milleri* (SOWERBY) amongst Cretaceous *Camptonectes* species with really macroscopic diverging striae.

For the differentiation between *C. virgatus* and *C. ? milleri* : see under *C. ? milleri.*

Generic attribution :

*Pecten virgatus* NILSSON bears the *Camptonectes*-sculpture and does not have any sculpture apart from concentric and very pronounced diverging radial lines and thus this species undoubtedly belongs to the genus *Camptonectes* and its correct name is *Camptonectes (Camptonectes) virgatus* (NILSSON).

## Stratigraphical and geographical distribution

Cenomanian : CZECHOSLOVAKIA :

Tyssa (DR.)

DENMARK :

Madsegrav, Bornholm (KO. orig. RAVN, 1925)

FRANCE :

Le Mans (Sarthe) (Ec. Min., Musé also orig. D'ORBIGNY 6452, Mus. Gen., N. M. W.)

GREAT BRITAIN :

Eastbourne, Sussex (S. M. orig. WOODS, pl. 37, f. 16)
Great Haldon, Devon (Geol. Sci. orig. WOODS *Pecten curvatus*, pl. 29, f. 7 a-b)

G. D. R. :

Pennrich (DR.)
Plauen (B.)

G. F. R. :

Essen (B.)
Fürnried (Mü.)

POLAND :

Silesia : Waltersdorf, Lähn (B.)

Turonian : AUSTRIA :

Orbitulitenschichten : Piesting (N. M. W ZITTEL orig. 1858 — III-73)

CZECHOSLOVAKIA :

Gostritz (DR.)
Randnitz (N. M. W.)
Weissenberg, Prag (N. M. W.)
Weissig, Pillnitz (Dr.)
Zohsec, Landskron (N. M. W.)

DENMARK :

Horsemyreodde, Bornholm (KO. orig. RAVN 1918)

G. D. R. :

Bergstrasse, Dresden (Mus. Gen.)
Pennrich (*Plenus* zone) (DR.)
Pirna (DR.)
Plauen (B., DR.)
Strehlen (DR., Mus. Gen.)

G. F. R. :

Martersberg, Passau (DR.)
Teufelsmühle, Thalmässing (Mü.)

Senonian : AUSTRIA :

Gosau-Tiefengraben (Geol. Bund. Anst., ZITTEL orig., N. M. W.)

CZECHOSLOVAKIA :

Kreibitz (B., DR., N. M. W.)
Tržiblitz (KO., N. M. W.)

G. D. R. :

Füssenag, Quedlinburg (B.)
Salzberg, Quedlinburg (B., Halle, Mus. Gen., N. M. W.)
Suderode, Quedlinburg (B.)

G. F. R. :

Haldem (B.)
Haltern (B.)

INDIA :

Ariyalur group, 1 ml W. Ariyalur, Trichinopoly (B. M.)

POLAND :

Bromberg (B.)
Kieslingswalda (B., DR., Musé., N. M. W. 1864.XL.448, Coll. REUSS)
Neu-Warthau (B.)

Campanian : G. F. R. :

Aachen (B.)

GREAT BRITAIN :

*B. mucronata* zone : Edward's Pit, Mousehold, Norwich (B. M.)

JAMAICA :

Catadupa Shales : Cambridge, Railway Cutting (B. M. orig. C. T. TRECHMANN, 1927, pl. 3, f. 7)
Providence Shales : Providence (B. M., C. T. TRECHMANN, 1927, pl. 3, f. 8)

THE NETHERLANDS :

Vaals (Ec. Min., I. R. Sc. N. B., Mü., Musé., N. M. W.)

SWEDEN :

Balsberg (KO., Lund)
Broeryd (Lund)
Carlshamm (KO.)
Ignaberga (Lund, orig. HENNIG, pl. 3, f. 32)
Ivöklack (KO.)
Köpinge (KO.)
Mallesholm (KO.)
Mörby (Lund, orig. NILSSON, pl. 9, f. 14 & 15)
Østra Sönnarslöv (KO.)

Maastrichtian : BELGIUM-NETHERLANDS :

very common in the Limburg basin (I. R. Sc. N. B.)
Maastricht (B., KO., Mus. Gen.)

BULGARIA :

Somovit (Univ. Sofia)

DENMARK :

Møen (KO.)
Skovbakken, Aalborg (KO.)

G. D. R. :

Rügen (GR.)

G. F. R. :

Hemmoor (GH.)

Upper Cretaceous : ALGERIA :

Tenoukla (B. M.)

INDIA :

Trichinopoly (orig. E. FORBES, p. 154, pl. 15, f. 22)

JAMAICA :

Blue Mountain Peak (B. M. orig. C. T. TRECHMANN, 1929, p. 487)

MOZAMBIQUE :

Sheringoma, Mazamba River (B. M. orig. R. B. NEWTON, 1924, p. 148)

TUNISIA :

Djebel ben Younès, Gafsa (B.M.)

S. A. U. :

Umzanbana River, Umtanvuna Series, Port Natal (B. M.).

## Camptonectes (Camptonectes) gaultinus (H. WOODS, 1902)

| | | |
|---|---|---|
| v . 1902 — | *Pecten (Camptonectes ?) gaultinus* sp. nov. | H. WOODS, p. 163, pl. 30, f. 1a-b, 2. |
| (1960) — | *Pecten gaultinis* (laps. cal.) Woods | M. S. ERISTAVI, p. 65. |
| ? 1968 — | *Chlamys (Chlamys) gaultina* Woods | S. I. PASTERNAK et al., p. 155, pl. 31, f. 1. |

### Location of holotype

Sedgwick Museum, Cambridge (Great Britain).

Stratum typicum :

Gault (Albian).

Locus typicus :

Folkestone (Kent) (England).

### Original description

H. WOODS, p. 163; nothing can be added to that description; the number of specimens known to-day is only slightly larger than in WOODS's days.

### Discussion

Whether this species is really a separate species is difficult to decide on the limited number of available specimens, which are mostly poorly preserved.

The straight, punctae-bearing striae are indeed an unusual feature; it could also be that these specimens are slightly aberrant *C. striatopunctatus* (ROEMER).

I am not quite convinced that the Ukrainian specimen belong to this species : the left valve mentioned by PASTERNAK is almost twice the size of the largest British specimen.

### Generic attribution :

Since this species is very closely related to *Camptonectes striatopunctatus* (ROEMER), it seems logical that if *Pecten gaultinus* WOODS is proved to be a separate species it will certainly also belong to the genus *Camptonectes* and hence the correct name is *Camptonectes (Camptonectes) gaultinus* (WOODS).

### Stratigraphical and geographical distribution

Albian : GREAT BRITAIN :

Black Ven (Dorset) (B. M., S. M. also orig. WOODS)
Cain's Folly, Stonebarrow Cliff, Charmouth (Dorset) (B. M.)
Folkestone (Kent) (S. M. also type WOODS)
Lyme Regis (Dorset) (S. M.)
Osmington (Dorset) (B. M.).

## Subgenus Boreionectes ZAKHAROV, 1965

Type-species *Pecten cinctus* SOWERBY, 1822. O. D.

Diagnosis. — The valves are large and orbicular; the auricles are small and rather narrow. The concentric ornamentation is more pronounced than the radial ornamentation on well preserved specimens.

### Geographical distribution

Boreal Eurasian seas.

### Stratigraphical range

Upper Jurassic to Middle Cretaceous.

## Camptonectes (Boreionectes) cinctus (J. SOWERBY, 1822)
Pl. I, fig. 1

| | | | |
|---|---|---|---|
| v . | 1822 | — *Pecten cinctus* | J. SOWERBY, p. 96, pl. 371. |
| . | 1825 | — *Pecten cinctus* Sow. | M. J. L. DEFRANCE, p. 254. |
| ? | 1835 | — *Pecten circularis* | A. GOLDFUSS, p. 76, pl. 99, f. 10 A & B. |
| non | 1835 | *Pecten circularis* G. B. SOWERBY, p. 110. | |
| . | 1839 | — *Pecten crassitesta* Nob. | F. A. ROEMER, p. 27. |
| . | 1841 | — *Pecten cinctus* Sow. | F. A. ROEMER, p. 50. |
| . | 1847 | — *Pecten crassitesta* Roemer | A. D'ORBIGNY, p. 584, pl. 430, f. 1-3. |
| | (1850) | — *Pecten crassitesta* Roemer | H. B. GEINITZ, p. 184. |
| | (1850) | — *Pecten crassitesta* Roemer | A. D'ORBIGNY, p. 83, n° 388. |
| | (1854) | — *Pecten crassitesta* Roem. | J. MORRIS, p. 176. |
| ? | (1854) | — *Pecten cinctus* Sow. | J. MORRIS, p. 176. |
| | (1866) | — *Pecten circularis* Gf. | C. GIEBEL, p. 50. |
| | 1868 | — *Pecten crassitesta* Römer (p.p.) | E. D'EICHWALD, pp. 427-429. |
| v . | 1870 | — *Pecten crassitesta* Roemer | F. J. PICTET & G. CAMPICHE, p. 212. |
| | (1871) | — *Pecten (Pseudamusium) crassitesta* Roem. | F. STOLICZKA, p. 428. |
| | (1874) | — *Pecten crassitesta* Roem. | H. ROEMER, p. 345, 347. |
| | 1884 | — *Pecten crassitesta* Roem. | O. WEERTH, p. 53. |
| . | 1895 | — *Pecten (Syncyclonema) crassitesta* A. Roemer | F. VOGEL, p. 54. |
| . | 1896 | — *Pecten crassitesta* A. Römer | A. WOLLEMANN, p. 838. |
| ? | 1899 | — *Pecten crassitesta* A. Röm. | G. MAAS, p. 249. |
| | (1899)a | — *Pecten crassitesta* A. Römer | A. WOLLEMANN, p. 64. |
| | (1899)b | — *Pecten crassitesta* A. Röm. | A. WOLLEMANN, p. 85. |
| | (1899)c | — *Pecten crassitesta* A. Röm. jung | A. WOLLEMANN, p. 91. |
| | (1899) | — *Pecten crassitesta* Roem. | J. KLOOS, p. 201. |
| . | 1900 | — *Pecten crassitesta* Roemer | A. WOLLEMANN, p. 39. |
| | (1902) | — *Pecten crassitesta* Roem. | J. KLOOS, p. 55. |
| v . | 1902 | — *Pecten (Camptonectes) cinctus* Sowerby | H. WOODS, pp. 152-155, pl. 28, textfig. 2. |
| . | 1905 | — *Pecten cinctus* Sow. | E. HARBORT, pp. 36-37. |
| | 1907 | — *Pecten* cf. *crassitesta* Roem. | K. DENINGER, p. 469. |
| | 1912 | — *Pecten (Camptonectes) cinctus* Sow. | A. WOLLLEMANN, p. 155. |
| | 1923 | — *Pecten (Camptonectes) cinctus* Sow. | V. K. PETKOVIC, p. 62. |
| | (1927) | — *Camptonectes cinctus* d'Orb. | P. FALLOT & J. R. BATALLER, p. 262. |
| . | 1931 | — *Pecten (Camptonectes) cinctus* Sow. | D. SOKOLOV & W. BODYLEVSKY, p. 57. |

| | | |
|---|---|---|
| . 1948 | — *Camptonectes cinctus* (Sowerby) | R. P. CHARLES, pp. 8-9. |
| (1949) | — *Pecten (Camptonectes)* cf. *cinctus* Sow. | W. MAYNC, p. 244. |
| (1957) | — *Pecten crassitestus* | W. HALLER, p. 133. |
| ? (1964) | — *Pecten (Camptonectes) cinctus* Sowerby | H. ARNOLD, p. 317. |

## Location of type-specimens

British Museum (Natural History) London, England, n° 43.300.
*Pecten crassitesta* : Roemer Museum, Hildesheim (G. F. R.).

### Stratum typicum :

In his description SOWERBY states his specimens come « probably » from the « inferior or Ironshot Oolite ». According to H. WOODS this interpretation is erroneous and the specimens come from the Claxby Ironstone (Lower Hauterivian).
*Pecten crassitesta* : Hils (Neocomian).

### Locus typicus :

The localities indicated by SOWERBY seem vague and are not indicated on the type-specimens. Consequently, it seems better to accept H. WOODS's. interpretation and consider Claxby (Lincs, Great Britain) as the type-locality)
*Pecten crassitesta* : Schöppenstedt, Hannover (G. F. R.).

## Original description

« Spec. Char. Orbicular, gibbose, longitudinally striated, imbricated; edges of the laminae, thin, erect; ears small; edge entire.

Remarkable for concentric, erect laminae, that are very numerous, especially towards the edge; but from their being thin, they are commonly worn off. The ears are strongly marked with close ridges : the valves are thick, especially towards the hinge, and of nearly equal convexity. The striae are sunk and rather irregular. Dawson Turner, Esq. of Yarmouth, celebrated for his botanical knowledge, was the first friend who sent me this interesting shell. It was found in the alluvial clay of Suffolk. The specimen figured was sent me from the neighbourhood of Horncastle by Mr. WEIR, both are remarkable for having grains of iron ore, arranged in one, two or three regular rows between the concentric laminae, according to the distance of those laminae, the grains being uniform in size. It is probable that they both belong to the inferior or Ironshot Oolite, although the first is filled with indurated marl. »

*Pecten crassitesta*

« P. (Pleuronectes) testa crassa maxima orbiculata convexo-plana concentrice lamelloso striata.

Gehört gleichfalls zu den Pleuronectiden. Die Schalen scheinen bis zu 8 Zoll gross und 3 Linien dick zu werden und kreisrund zu sein; sie sind von starken, etwas blättrigen concentrischen Streifen bedeckt und flach gewölbt; die vorderen Ohren scheinen rechtwinklig zu sein.

Nur Burchstücke dieser Art haben wir im Hilse bei Schandelahe und Schöppenstedt gefunden. »

## Additional description

Number of specimens studied : 64.

| | |
|---|---|
| British Lower Cretaceous ... ... ... ... ... | 26 |
| German Lower Cretaceous ... ... ... ... ... | 33 |
| French Lower Cretaceous ... ... ... ... ... | 4 |
| Swiss Lower Cretaceous ... ... ... ... ... ... | 1 |

Measurements :

This is a very large species; the largest specimens have a U. P. D. = W = 250 mm. A. A. varies between 120° and 140°.

Description :

Diagnosis. — Large to very large *Camptonectes* species with very small auricles and a regular concentric ornamentation.

The valves are almost orbicular and equilateral; they are relatively convex.

Right valve : the concentric ornamentation is not highly developed : it consists of thin concentric grooves and is crossed by diverging radial striae. The apical margins are short, straight or slightly concave; the auricles are very unequal; the anterior one is elongated, with a deep byssal sinus bordered with the strongly marked continuation of the concentric growthlines. The posterior auricle is small and covered with strongly marked concentric growthlines; its outer angle is obtuse, or almost rectangular.

Left valve : the concentric ornamentation is much more developed than on the right valve; in many cases the concentric striae are covered with concentric laminae, which can be slightly elevated above the shell surface. The radial diverging striae are less developed than on the right valve. The auricles are slightly unequal in surface : the anterior one has a rectangular or acutangular outer angle, whereas the posterior auricle is rectangular or obtuse and usually smaller than the anterior one.

## Discussion

Variability :

As already stated by H. Woods the proportion U. P. D./W can vary greatly in C. *cinctus* and results in two different shapes of the discs. H. Woods figured and described the extremes in the variation.

The number of known specimens is small; hence it has been impossible to check whether the shape variation can be correlated with stratigraphical origin.

It is surprising that no small specimens of C. *cinctus* have been recorded; it could be that eventual small specimens have been considered as belonging to another species such as C. *cottaldinus* (d'Orbigny), for

instance or otherwise, small specimens were very brittle and did not fossilize.

Synonymy :

*Pecten circularis* GOLDFUSS seems to be lost; consequently, the problem as to whether it is synonymous with *C. cinctus* cannot be solved.

*Pecten crassitesta* ROEMER is identical with *C. cinctus;* ROEMER said this in 1841 but other German authors continued to use the ROEMER-name. The identity of both taxa can easily be checked on the topotypical specimens in the Museum of the von Humboldt University of Berlin.

D'EICHWALD's description leaves some doubt as to the complete identity of his material with *C. cinctus* because the auricles he describes are *Entolium (Amusiidae)* auricles and not *Camptonectes*-auricles. If he only possessed left valves, however, then the description could be understandable.

Differentiation :

In the genus *Camptonectes,* as represented in Cretaceous deposits, *C. cinctus* is unusually large. In Jurassic deposits, however, large *Camptonectes* species are known : *C. giganteus* ARKELL, 1926 from the Berkshire Oolite Series and *C. sandfootensis* ARKELL, 1930 from the Upper Calcareous Grit.

*C. cinctus* is easily differentiated from other Cretaceous *Camptonectes* species :

*C. dubrisiensis* (WOODS) is less convex, has a less developed concentric macrosculpture, larger auricles and U. P. D./W. is always more than 1.

*C. cottaldinus* (D'ORBIGNY) has larger auricles, less convex and less circular valves, and a narrower umbonal angle. The concentric ornamentation is less developed. Because of the last three characteristics it is possible to differentiate even incomplete (i.e. auricle-missing) specimens.

*C. virgatus* (NILSSON) is very much smaller and, apart from a strongly and rather coarsely developed *Camptonectes*-ornamentation, it is smooth; the auricles are broader and the umbonal angle is narrower.

*C. striatopunctatus* (ROEMER) has larger auricles and appears smooth : its only ornamentation is a very fine, almost microscopical *Camptonectes*-ornamentation.

*C. gaultinus* (WOODS) is very small, and less convex; it does not have a concentric ornamentation and U. P. D./W. is always more than 1.

*C. ? milleri* (SOWERBY) has a radial ornamentation consisting of « ribs » and the diverging punctate striae are straight.

Some badly preserved auricle-missing *C. cinctus* can be differentiated from *Entolium orbiculare* (SOWERBY) by :

— the absence of *Camptonectes*-microsculpture on *E. orbiculare* (a microsculpture of diverging radial striae is found on all *Pectinidae*, but not on *Amusiidae*);
— the almost flat shell-shape in *E. orbiculare* (can be used even if the preservation state is a « Steinkern »);
— the very brittle and thin shells in *E. orbiculare*.

### Generic attribution :

*Pecten cinctus* SOWERBY, 1822, is the type-species of *Camptonectes (Boreionectes)* and the correct name automatically becomes *Camptonectes (Boreionectes) cinctus* (SOWERBY, 1822).

### Stratigraphical and geographical distribution

Berriasian : GREAT BRITAIN :
Spilsby Sandstone : Acre Ho (Lincs.) (B. M.)

Valanginian : G. F. R. :
Jetenburg (KO.)
Ziegelei Müller, Hutting, Binkeburg (KO.)

Hauterivian : FRANCE :
Sobey, Villers-le-Lac (Doubs) (Mus. Gen.)

GREAT BRITAIN :
Speeton Clay : Speeton (Yorks.) (B. M.)
Claxby Ironstone : Acre Ho (Lincs.) (B. M., S. M. orig. WOODS, pl. 28, f. 2 a-b, B 11276)
Claxby (Lincs.) (S. M.)
Donnington (Lincs.) (S. M.)
Tealby (Lincs.) (S. M.)
Tealby Ironstone : Claxby (Lincs.) (S. M.)

G. F. R. :
Stadthagen (B. M.)
Tagebau Haverlahwiese, N. Salzgitter (Mü.)

Hauterivian-Barremian : GREAT BRITAIN :
Tealby Clay : Acre Ho (Lincs.) (B. M.)
Claxby Ironworks (Lincs.) (B. M.)

Barremian : GREAT BRITAIN :
Speeton Clay, Zone B. : Speeton (Yorks.) (B. M.)

Neocomian (no more precise stratigraphical data available) :

FRANCE :
Ville-sur-Saux (Haute-Marne) (Coll. PELLAT, U. C. L.)

GREAT BRITAIN :

Sandown Bay (Isle of Wight) (B.)
Suffolk (alluvial Clay) (B. M.)

G. F. R. :

Berklingen, Braunschweig (B., Ec. Miss., Mus. Laus.)
Braunschweig (Mus. Gen.)
Bredenbeck (Ec. Min., I. R. Sc. N. B.)
Ehlberg, Bielefeld (B.)
Gildehäuser Berg (Halle)
Gross Vahlberg (B., DR.)
Haverlahwiese, Salzgitter (Halle)
Langenberg (B.)
Mehler und Elzer Forst (B.)
Neustadt am Rübenberge (B.)
Osterwalde (B., Halle)
Rothberg, Schöppenstedt (B.)
Sachsenhagen (Halle)
Salzgitter (S. M.)
Schöppenstedt (B.)
Thiede (B.)
Vahlberg (Mus. Gen.)

SWITZERLAND :

Ecluse (Univ. Neuch.).

## Camptonectes (Boreionectes) dubrisiensis (H. Woods, 1902)

| | | |
|---|---|---|
| v . 1902 — | *Pecten (Camptonectes) dubrisiensis* sp. nov. | H. Woods, pp. 162-163, pl. 29, f. 8 a-c. |
| v . 1916 — | *Pecten (Camptonectes) dubrisiensis* Woods | J. P. J. Ravn, pp. 26-27, textf. 1. |
| . 1968 — | *Chlamys (Camptonectes) dubrisiensis* Woods | S. I. Pasternak et al., p. 167, pl. 31, f. 2. |

### Location of holotype

British Museum (Natural History), London (England), n° 38243 : Woods's figure is slightly idealised, but otherwise excellent.

### Locus typicus :

Dover (Kent) (Great Britain).

### Stratum typicum :

Chalk Marl (Lower Cenomanian, *S. varians* zone).

## Original description

in WOODS, 1902.

## Additional description

Number of specimens studied : total 25

British Cenomanian ... ... ... ... ... ... ... 23
Danish Cenomanian ... ... ... ... ... ... 2

Measurements :

On British specimens :

U. P. D. varies from 31.4 mm to 90.7 mm; av. 65.02 mm (n = 13)
W. varies from 57.5 mm to 84.5 mm; av. 67.46 mm (n = 10)
A. A. varies from 98° to 115°; av. 106° (n = 14)

Description :

Diagnosis. — Medium to large-sized *Camptonectes* species, with very light concentric ornamentation, relatively large and very long anterior auricles, and almost orbicular shells.

For a description see WOODS; nothing significant can be added to what he wrote.

## Discussion

Considering the small number of specimens studied, there is no point in discussing the variability.

Differentiation :

The larger part of the discs are smooth, apart from the *Camptonectes*-sculpture, in *C. dubrisiensis* (WOODS); near the pallial and side margins a rather pronounced concentric ornamentation exists.

*C. cinctus* (SOWERBY) is more convex, has a more pronounced concentric ornamentation and smaller auricles; most *C. cinctus* specimens reach much larger sizes than *C. dubrisiensis*.

*C. cottaldinus* (D'ORBIGNY) has a far more pronounced concentric ornamentation, a narrower shape, larger and broader auricles.

*C. virgatus* (NILSSON) is much smaller, has a very coarse microsculpture in which the diverging striae have a depth on the shell disc; the valves are more convex.

*C. striatopunctatus* (ROEMER) has a more elongated shape, a regular and clearly distinguishable microsculpture.

Generic attribution :

The large size and the small narrow auricles of this species make it more akin to *Pecten cinctus* than to *Pecten lens*, and thus its correct name should be *Camptonectes (Boreionectes) dubrisiensis* (WOODS, 1902).

Stratigraphical and geographical distribution

Cenomanian : DENMARK :

Madsegrav (Bornholm) (KO., orig. J. P. J. RAVN, 1916)

GREAT BRITAIN :

*Schloenbachia varians* zone :

Burham (Margett's Pit) (Kent) (B. M.)
Burwell (Cambs.) (S. M.)
Dover (Kent) (B. M., WOODS' holotype)

*Holaster subglobosus* zone :

Cherryhinton (Cambs.) (S. M.)
Dover (Kent) (B. M.)
Folkestone (Kent) (S. M.).

## Camptonectes ? milleri (J. DE C. SOWERBY, 1836)

| | | |
|---|---|---|
| . 1836 | — *Pecten Millerii* M. | J. DE C. SOWERBY in FITTON, p. 241, 342, pl. 17, f. 19. |
| (1850) | — *Pecten Millerii* Sow. | A. D'ORBIGNY, p. 169, n° 488. |
| 1854 | — *Pecten Milleri* Sow. | J. MORRIS, p. 176. |
| v . 1870 | — *Pecten Milleri* Sow. | F. J. PICTET & G. CAMPICHE, p. 214. |
| 1871 | — *Pecten Milleri* Sow. | F. STOLICZKA, p. 428. |
| v . 1902 | — *Pecten (Chlamys) Milleri* Sowerby | H. WOODS, pp. 168-169, pl. 31, f. 3a, b, 4, 5, 6a, b. |

Location of holotype

Bristol Museum (England) (fide WOODS).

Stratum typicum :

Blackdown Sands (Upper Albian).

Locus typicus :

Blackdown, Devon (Great Britain).

## Original description

« Oblong, rather convex; radii smooth, sharp, numerous, especially towards the edge; close together. The two smaller figures represent an unusually convex specimen. »

## Additional description

Number of specimens studied : 45
From the English Gault (Albian and Cenomanian).

### Measurements :

All measurable specimens are considered, without taking the different localities separately into account.

U. P. D. varies from 11.3 mm to 36.1 mm; av. 19.7 mm (n = 16)
W. varies from 10.2 mm to 31.2 mm; av. 17.15 mm (n = 17)
A. A. varies from 69° to 90°; av. 79.1° (n = 19)

### Description :

Diagnosis. — Small to medium sized *Camptonectes* species with a vague rib ornamentation.

To WOODS's description nothing significant can be added except that the value he gives for the A. A. seems to be slightly exaggerated : according to my measurements its maximal value is 90°, but WOODS's one and only indication is 99°. I studied virtually the same specimens as he did, so it could be that the difference is due to different measuring methods.

WOODS has drawn another important characteristic but does not mention it in the text : pl. 31, fig. 3 b shows the *Camptonectes* sculpture.

## Discussion

### Variability :

In some specimens ribs are present : they are elevated above the disc surface (WOODS, 1902, pl. 31, fig. 4 a & 6 b). On other specimens the shell is smooth (i.e. the disc-surface is divided into thin radial ribbons by the *Camptonectes* striae).

The rather unusual ornamentation makes it difficult to decide the exact generic position of *Pecten milleri* : it is the only Cretaceous species that combines « *Chlamys* » and *Camptonectes* characteristics. For analogous Jurassic species ARKELL proposed the new genus *Camptochlamys* (ARKELL, 1930). *Pecten milleri*, however, is not a *Camptochlamys* because it lacks the typical concentric ornamentation. Apart from the ribs on some specimens it has all the *Camptonectes* characteristics and, for instance, is much more convex than *Camptochlamys*.

Differentiation :

Left valves of *Pecten milleri* are very similar to *Camptonectes virgatus* (NILSSON), particularly when they do not have ribs. The only real difference is that the *Camptonectes*-sculpture is less pronounced in *P. milleri,* on right and left valves, and the « diverging » lines are almost straight and rarely divide.

The other *Camptonectes*-species differ by their size and/or have a well developed macrosculpture.

Generic attribution :

Whether *Pecten milleri* SOWERBY really belongs to *Camptonectes*, I have not been able to ascertain (see under Variability). At present it seems safer to use *Camptonectes ? milleri* (SOWERBY).

## Stratigraphical and geographical distribution

All specimens come from British strata.

Albian :

Blackdown, Devon (B. M., Mus. Gen., S. M. also orig. WOODS)
Culver Hole, Seaton, Devon (B. M.)
Folkestone, Kent (B. M.)
Haldon, Devon (B. M.)
Okeford Fitzpaine, Devon (B. M. orig. R. B. NEWTON, 1897, *Proc. Dorset Field Club*, 18, pl. 3, f. 10, 10 a fide Register B. M.)
Osmington, Dorset (B. M.)
Peak Hill, Sidmouth, Dorset (B. M.)
Pinhay, Devon (B. M.)
Ponchydown, Blackdown (Mus. Gen.)
Sidmouth, Dorset (B. M.)
White Cliff, Seaton, Devon (B. M.)

Albian-Cenomanian : Upper Greensand :

Hearthstone Quarry, S. E. Marden Castle, Godstone, Surrey (B. M.)
Ventnor (Isle of Wight)

Cenomanian : Chalk Marl :

Burham, Peter's Pit, Kent (B. M.).

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KONINKLIJK BELGISCH INSTITUUT VOOR NATUURWETENSCHAPPEN.
INSTITUT ROYAL DES SCIENCES NATURELLES DE BELGIQUE.

## SYSTEMATIC INDEX

## GEOGRAPHICAL INDEX

Abbreviations :

C. H. : Switzerland
G. B. : Great Britain
G. D. R. : German Democratic Republic
G. F. R. : German Federal Republic
S. A. U. : South African Union

## EXPLANATION OF PLATES

All specimens in I. R. Sc. N. B., Section of Mesozoic and Caenozoic Invertebrates, Department of Palaeontology.

### PLATE I

Fig. 1. — *Camptonectes (Boreionectes) cinctus* (J. SOWERBY, 1822), right valve, × 3/4; Ville-sur-Saux, Haute-Marne (France); Neocomian; T. C. M. I. 9816.

Fig. 2. — *Camptonectes (Camptonectes) striatopunctatus* (F. A. ROEMER, 1839), fragment of right valve, × 4; Elligser Brink, Hannover (G. F. R.); Hilsthon; T. C. M. I. 9880.

## PLATE II

Fig. 1. — *Camptonectes (Camptonectes) virgatus* (S. NILSSON, 1827).
a : right valve, × 2; Sint Pietersberg, Maastricht (The Netherlands); Upper Maastrichtian; T. C. M. I. 9857.
b : right valve, × 2; Maastricht (The Netherlands); Upper Maastrichtian; T. C. M. I. 9858.
c : left valve, × 2; Eisden, Charb. Limb. Puits 2, 431-433 m (Belgium); Campanian (Hervien); T. C. M. I. 9856.

Fig. 2. — *Camptonectes (Camptonectes) cottaldinus* (A. D'ORBIGNY, 1847), left valve, × 1; Marolles, Aube (France); Neocomian; T. C. M. I. 9825.

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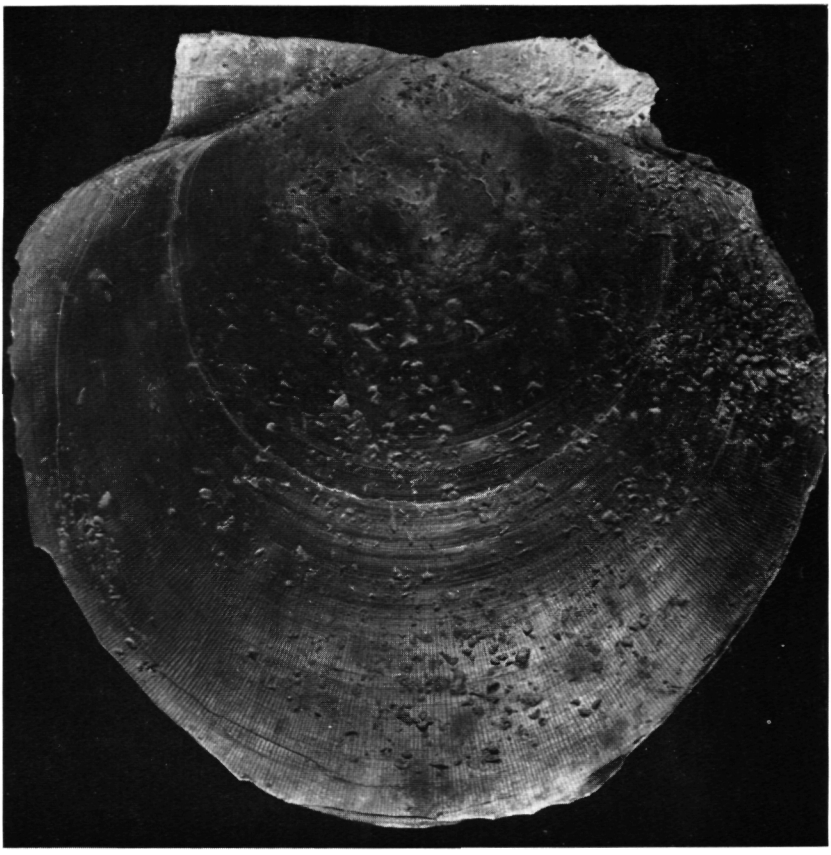

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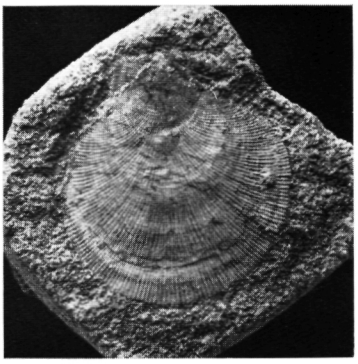
A. V. DHONDT. — Systematic revision of the *Chlamydinae* (*Pectinidae*, *Bivalvia*, *Mollusca*) of the European Cretaceous. Part 1 *Camptonectes*.

1 a



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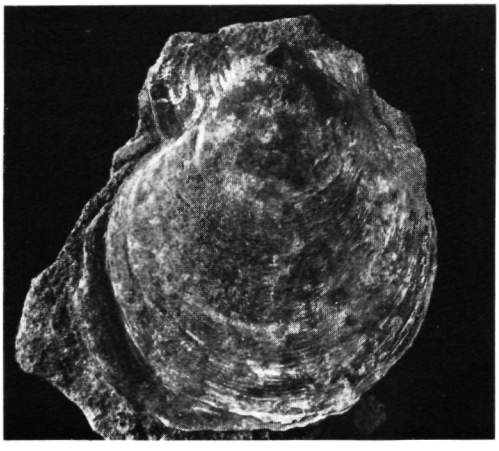

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A. V. DHONDT. — Systematic revision of the *Chlamydinae* (*Pectinidae*, *Bivalvia*, *Mollusca*) of the European Cretaceous. Part 1 *Camptonectes*.